The Proposed Alberta-Pacific Pulp Mill: Report of the EIA Review Board

March, 1990

THE ALBERTA-PACIFIC
ENVIRONMENTAL IMPACT ASSESSMENT REVIEW BOARD

90-07314/

THE ALBERTA-PACIFIC ENVIRONMENTAL IMPACT ASSESSMENT REVIEW BOARD

This report is respectfully submitted to the Alberta Minister of Environment.

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DATED at the City of Edmonton, in the Province of Alberta, this 28th day of February, 1990.

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ENVIRONMENTAL IMPACT ASSESSMENT REVIEW BOARD

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The Review Board also thanks representatives of Alberta-Pacific and the many government departments and organizations which participated in the review, and all of the other participants for their contributions to the process.

Executive Summary

The Review Board was established jointly by the Alberta and federal governments to conduct an environmental review of the bleached kraft pulp mill proposed by Alberta-Pacific Forest Industries Inc. for the County of Athabasca #12. The terms of reference were to review the environmental impacts of the proposed mill, explicitly including a number of matters of federal jurisdiction. The Board was to address the effects of timber harvesting on Indian Reserve Lands, but not otherwise review forest harvesting and the proposed Forest Management Agreement (FMA).

Public hearings were held in 11 different communities beginning October 30, 1989 and ending December 15, 1989. Written submissions were accepted up to and including January 15, 1990. Some 750 submissions were received, and the total attendance at all of the hearings exceeded 5,000, indicating a high degree of interest.

Although the proposed mill would be one of the least polluting bleached kraft pulp mills in the world, and even though it would have economic benefits associated with it, the Review Board recommends that it not be approved at this time. The major reason for this recommendation is the effluent which would be discharged to the Athabasca River, and in particular, its content of chlorinated organic compounds and the cumulative effects this effluent and that from other mills would have on the Athabasca-Peace River system. Alberta-Pacific would use technology which would reduce the chlorinated organic compounds to a low concentration. However, the limited available data indicate that there are already measurable amounts of dioxins and furans in fish in the river system near existing mills and extending to more than 1,000 km downstream.

The Review Board therefore recommends that further scientific studies on the river systems be conducted to determine if the Alberta-Pacific proposed mill could proceed without serious hazard to life in the river and for downstream users. There is also potential that dissolved oxygen concentrations of the river may not be high enough to sustain fisheries, and this matter along with a review respecting certain other contaminants should be included in the river study. The studies should be managed by an intergovernmental committee with representation from all stakeholders.

The Review Board is satisfied that the other environmental impacts of the proposed mill, if the appropriate conditions are applied, could be made acceptable. It does, however, believe that a further review of the Alberta-Pacific proposed site should be made to determine if there is a superior one in a less populated area.

The exclusion of the FMA from the review was strongly objected to by many participants in the hearings, and in the judgement of the Review Board was a serious shortcoming in the process. A thorough public review of the proposed FMA should be carried out before the mill is approved.

The Review Board's assessment of the impact of timber harvesting on Indian Reserve Lands was somewhat limited by the amount of data it received. It concluded that the effects of timber harvesting are potentially very significant, and recommends that affected Indian Bands be involved in a meaningful way in the negotiations and preparation of the FMA.

The Review Board gained considerable knowledge and experience regarding the process by which Environmental Impact Assessments should be reviewed. It has made several recommendations to improve the system currently in use.

The Review Board recognizes that its recommendation, not to approve the mill at this time, will be a disappointment to many people who had hopes for improved economic opportunities in the Athabasca area. However, the Board is convinced that further scientific work should be done to remove uncertainties regarding the expected cumulative impacts on the river system of effluent discharges from the proposed and existing pulp mills.

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1. INTRODUCTION

This section of the report introduces the subject matter by briefly describing the proposed bleached kraft pulp mill, the Board that was formed to review the environmental impacts of the proposal, the terms of reference of the Review Board, and the public hearing process by which it reviewed the proposed project. Also included is summary information respecting the hearings, participants, and the nature and types of submissions received.

1.1 The Proposed Pulp Mill

Alberta-Pacific Forest Industries Inc. (Alberta-Pacific) proposed a bleached kraft pulp mill to be built in the County of Athabasca #12. The proposed location of the mill within Alberta and relative to the town of Athabasca, the Athabasca River, and other significant geographic features is shown in *Figure 1-1, Proposed Location of Alberta-Pacific Mill*. The proposed mill would utilize hardwood and softwood forest resources, and would have production capacities of 1,500 Air Dryed tonnes per day (ADt/d) of hardwood pulp or 1,250 ADt/d of softwood pulp. Alberta-Pacific initially planned to begin construction in late 1989 but this was delayed by the Environmental Impact Assessment (EIA) review process.

The wood supply would come from an area mainly north and east of the proposed mill site as shown in *Figure 1-2, Area of Proposed Forest Management Agreement*. Hardwood furnished to the mill would be primarily aspen poplar, with some balsam poplar. Softwood fibre would be predominantly white spruce, with some jack pine, black spruce, and balsam fir included.

The wood supply would be trucked to the mill on a year-round basis, except for the spring break up period. Two new major road systems would be required, one reaching northwest to the Calling Lake area and then to Wabasca, and the other extending east to Highway 63. Rail access to the site would be provided by construction of a spur line leading north from the existing Canadian National Railways (CN) line at Boyle. (The proposed rail line and major new roads are shown in *Figure 6-1, Proposed Mill Site Location and Infrastructure.*)

The proposed mill would be a single line operation that alternately produces hardwood and softwood pulp in separate runs. The wood supply would be prepared by mechanically debarking and chipping the wood delivered to the mill site. The chips would be sorted and, prior to use, would be screened and then conveyed to the continuous digester system. They would be cooked at elevated temperature and pressure in an alkaline solution, using the extended delignification technology to dissolve the lignin binder and other non-cellulosic materials. The cooked pulp would be washed and screened to remove fibre bundles. The pulp would then be given a medium density oxygen delignification treatment, followed by more washing. The bleaching of the pulp would involve a high ratio of about 70 per cent substitution of chlorine dioxide for elemental chlorine.

The bleached pulp would be cleaned and sent to the pulp machine, where it would be baled. The pulp would be stored on-site or loaded directly into rail cars for shipment.

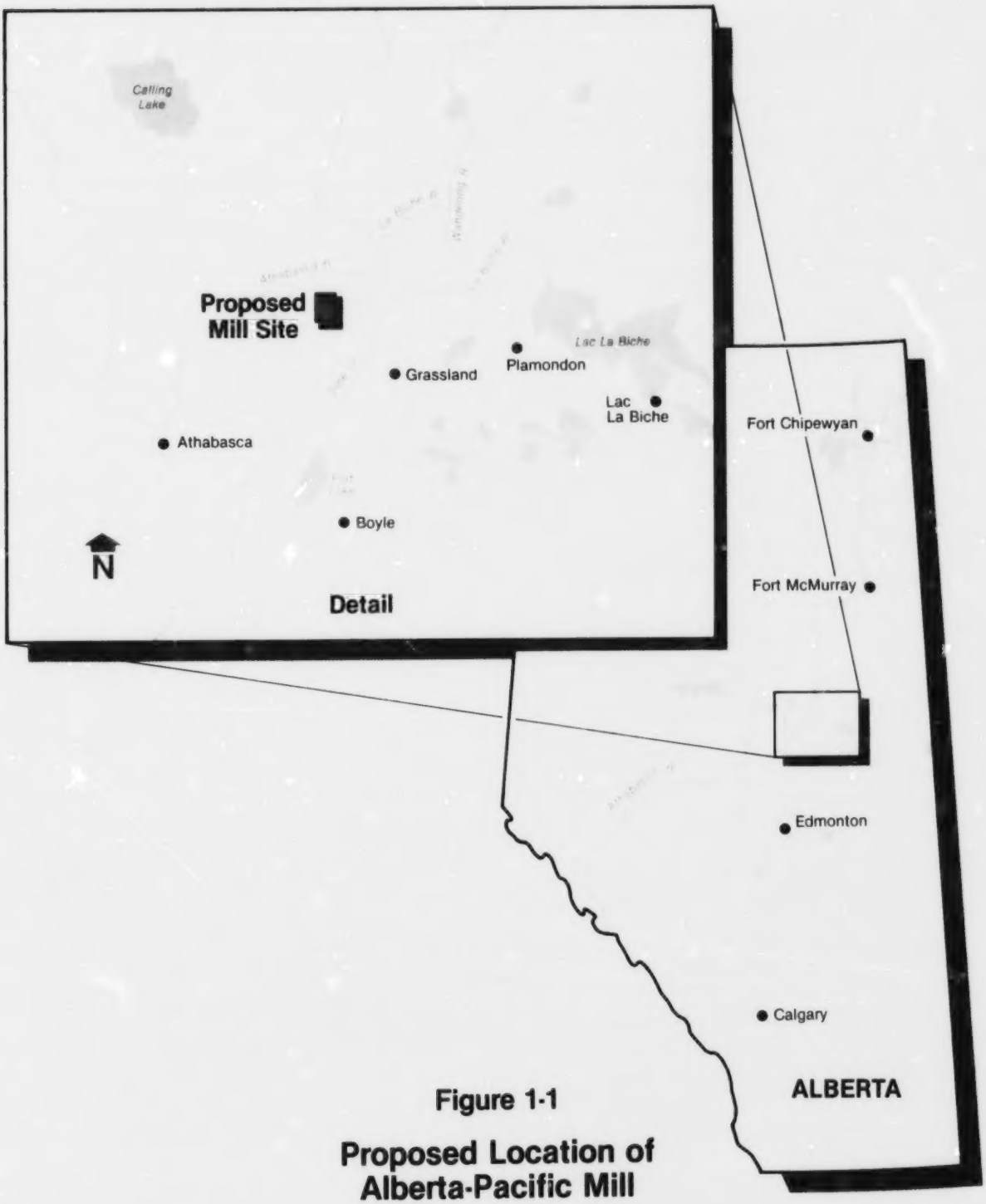


Figure 1-1

Proposed Location of Alberta-Pacific Mill

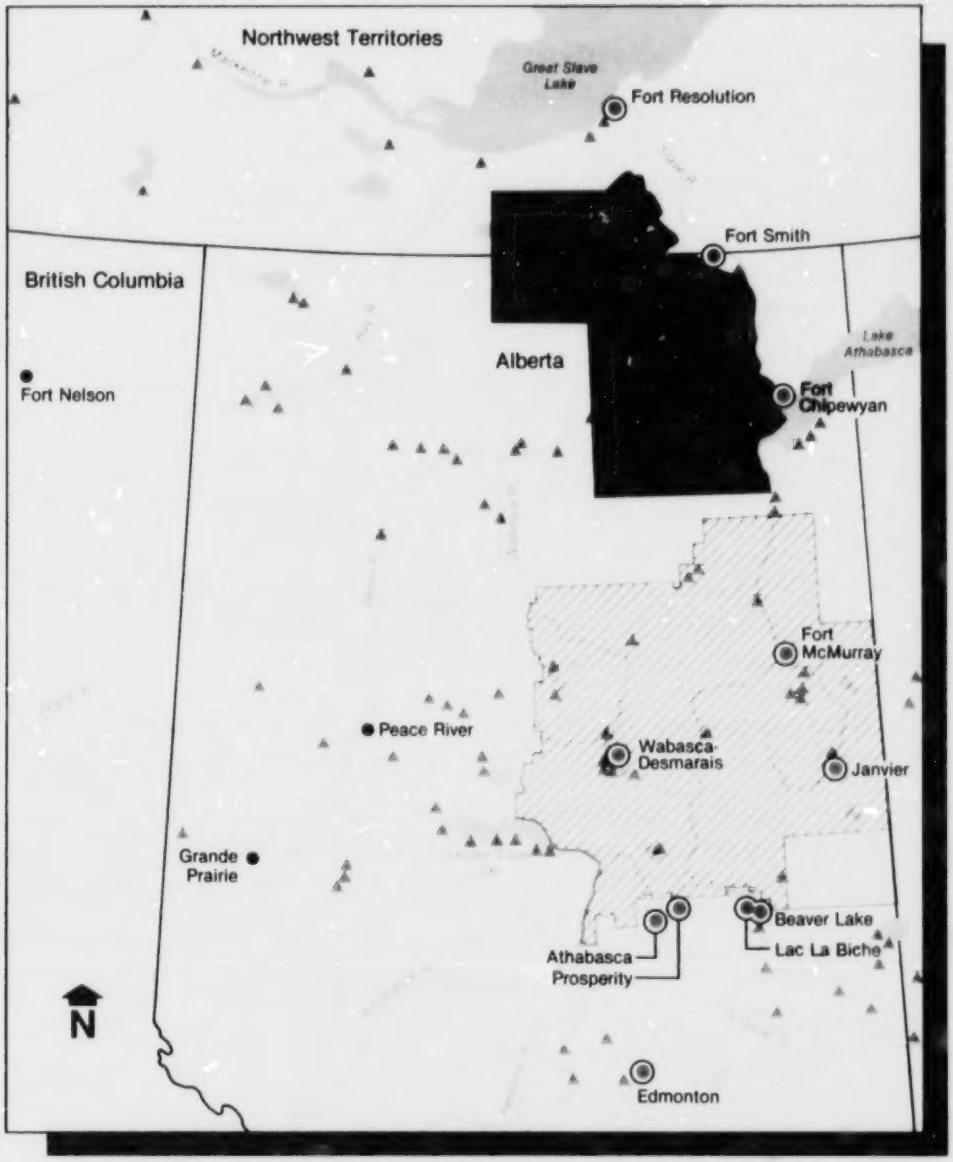


Figure 1-2

Area of Proposed Forest Management Agreement (FMA)

The mill would be essentially self-sufficient in electric power. Steam would be generated in a chemical recovery boiler and a power boiler designed to burn waste wood and other material.

Water used in the pulp mill would be obtained from the Athabasca River. The mill effluents would pass through an activated sludge secondary treatment system using an extended aeration biological process before being returned to the river. The required raw water supply capacity would be approximately 134,000 cubic metres per day (m^3/d). Water would be taken from the river through an open channel intake and moved to the mill through a buried pipeline. At the mill, raw water would be treated as required to produce a softened clarified water suitable for process requirements. Approximately 90 per cent of water withdrawals would be returned to the river: 55 per cent as treated effluent, and 45 per cent as clean cooling water. Solids removed from the raw water would be sent to landfill.

During construction, workers would be housed in an on-site camp in prefabricated buildings for approximately 18 months. Capital investment would be some $1.3 billion, and Albertan and Canadian content would be emphasized for all major expenditures. Direct employment during construction was estimated by Alberta Pacific at some 33,600 person-months over the period 1989-1991. Operations would employ in excess of 1,000 persons.

1.2 The Review Board

The Alberta and Federal Ministers of the Environment agreed, on July 11, 1989, to a joint provincial-federal public review of the environmental impacts of the proposed pulp mill. An independent eight-member board was established to conduct the public review. Four of the members were appointed by the Alberta Minister of Environment, two by the Federal Minister, and one by the Government of the Northwest Territories. The Chairman was selected by agreement between the Alberta and Federal Ministers of Environment.

The Review Board members are:

Gerry DeSorcy, Chairman of the Alberta Energy Resources Conservation Board. (Mr. DeSorcy is the Chairman of the Review Board.)

Jim Boucher, Chief of the Fort McKay Indian Band.

Ron Epp, a pilot who has lived in the Athabasca and Lac La Biche regions for 15 years.

Mike Franchuk, a long-time farmer from the Wandering River area.

Cindy Gilday, a resident of the Northwest Territories, whose work has focused in the area of environmental issues through Indigenous Survival International.

Bill Ross, Professor of Environmental Science at the Faculty of Environmental Design, The University of Calgary.

David Schindler, an environmental scientist and Killam Memorial Professor in the Departments of Zoology and Botany, Faculty of Science, University of Alberta.

Ted West, Superintendent of Schools for the County of Athabasca #12.

1.3 The Terms of Reference

The Review Board was given its terms of reference by a Ministerial Order issued by the Alberta Minister of Environment. A copy of the Order is included as Appendix A. The terms of reference were to examine all environmental impacts of the proposed Alberta-Pacific pulp mill, including biophysical impacts such as those related to emissions to the atmosphere and discharges to the Athabasca River, and socio-economic impacts such as those resulting from an increased workforce in the region during construction and operations. Excluded were the environmental effects of timber harvesting operations other than as they relate to Indian Reserve Lands.

In considering the impact of the mill on the Athabasca River, the Board was directed to examine the cumulative effects on the Peace-Athabasca River system of existing discharges as well as those which would result from the Alberta-Pacific and other proposed mills.

The terms of reference included an examination of potential impacts on water quality in the Northwest Territories, fisheries, navigable waters, and Wood Buffalo National Park.

The Review Board was asked to investigate and report on the manner in which Alberta-Pacific responded to the concerns of local citizens and recognized those concerns in its plans for the mill.

1.4 The Public Review Process

The initial Ministerial Order directed that hearings be held in Athabasca, Prosperity, Lac La Biche, Fort McMurray, and Fort Smith. It also provided flexibility for the Review Board to consider holding additional hearings in other communities.

The Board held information meetings in early September, 1989, in each of the five hearing locations identified in the Ministerial Order. The information meetings were to advise interested parties regarding the makeup of the Review Board, how and why it was formed, and its terms of reference.

The agreement between governments provided for some funding assistance by the respective governments to potentially affected individuals or groups who wished to participate in the hearings. The Review Board had no responsibility for such funding, but did provide information regarding the matter to attendees at its information meetings.

The Review Board received many requests for hearings at locations in addition to those established by the Order. On the basis of such representations and its understanding of the terms of reference, the Review Board scheduled and announced additional hearings for Fort Chipewyan, Fort Resolution, Wabasca-Desmarais, Beaver Lake and Janvier. The Ministers subsequently added Edmonton as a hearing location.

The procedures used at the hearings were relatively informal and flexible. The model used was essentially as follows:

1. The Chairman opened the hearings.

2. Alberta-Pacific presented its documents and made an opening statement.

3. Government departments that wished to participate in a particular hearing presented any documents or submissions as required. They were then subject to questions, either orally or in writing.

4. The participants then came forward, made their presentations and asked questions of Alberta-Pacific, and sometimes, government departments. This activity constituted the major portion of each hearing. (During steps 2, 3 and 4, the Review Board members asked questions.)

5. Alberta-Pacific made brief closing remarks.

6. The participants made brief closing remarks.

7. The Chairman closed the hearing.

Due to the large number of submissions and new information received throughout the period of the hearings, the Review Board provided for written submissions up to and including January 15, 1990. Written submissions filed after the closing date of the final hearing, December 15, 1989, were intended only to allow for responses or comments regarding information filed late in the series of hearings, and not for the filing of new studies or information.

All reports submitted by Alberta-Pacific or government departments, and all submissions received from other participants, along with transcripts of the hearings, were made available as soon as practical, following each hearing session, in a central location in each of the hearing centres.

1.5 Assistance to the Review Board

The Review Board required assistance in arranging for the hearings and related travel, responding to mail, answering telephone calls, and most importantly, scheduling participation in the hearings and keeping a record of the many submissions. It therefore formed a small Secretariat headed by Dr. George Kupfer.

Very early in its existence, the Review Board arranged a series of briefing sessions to assist it in preparing for the hearings. The topics covered a wide range, and none of the presentations dealt specifically with the Alberta-Pacific proposal. A summary of the briefing session topics and attendees was included in the public record as document O-190.

During the course of the hearings, the Review Board recognized the need for further assistance in reviewing and understanding certain technical information provided to it. The Review Board obtained this "technical advice" from experts, and any advice or information provided to it was made public.

In the case of Dr. Everett Peterson, a forestry expert, his assistance was enlisted early enough in the process that he appeared at the hearing in Grassland Hall on December 8, 1989, presented his advice and answered questions. The following other experts were engaged at a time which did not facilitate their appearance at the hearings. Their advice to the Board was in writing and was made part of the public record along with all other submissions.

Expert and Subject	Document Identification Number
Ed Barnes, E.T. Barnes and Associates Inc. Pulp and Paper Consulting Specialists	(O-1, O-2 and O-57)
Richard Roberts, Praxis A Social Planning Company	(O-4)
Dr. Ted Van Dyke, Bear Spike Holdings Consulting Anthropologist	(O-3)
John Thompson, Thompson Economic Consulting Services	(O-4)

2. THE PUBLIC HEARINGS AND THE POSITIONS OF VARIOUS PARTICIPANTS

2.1 The Hearings

Some 250 individuals, organizations and groups participated in the 27 days of hearings in 11 different communities. Various combinations of oral presentations, questions and written personal and consultant-prepared submissions were received. A list of all presenters by hearing location is presented in Appendix B. In all, 750 written submissions were received, registered and publicly distributed along with the 55 transcript volumes, comprising some 7,600 pages. A list of all submissions and additional copies of this report are available from Alberta Environment. The total attendance at all of the sessions was approximately 5,000.

Hearings took place at the various locations in Alberta and the Northwest Territories, which are shown in *Figure 1-2,* on the following dates in 1989:

Location	Hearing Dates
Fort McMurray	October 30 and 31
Janvier	November 1
Lac La Biche	November 3 and 4
Beaver Lake	November 8
Fort Chipewyan	November 9 and 10
Fort Smith, N.W.T.	November 15 and 16
Athabasca	November 17, 18, 20 and 21
Fort Resolution. N.W.T.	November 22
Prosperity	November 23 and 24 (Prosvita Hall)
Fort McMurray	November 25
Edmonton	November 30, December 1, 2 and 4
Wabasca-Desmarais	December 5
Prosperity	December 7 and 8 (Grassland Hall) and December 14 and 15 (Prosvita Hall)

2.2 The Positions of the Various Participants

This section briefly outlines the positions taken by various groups of participants on a number of issues directly relevant to the Alberta-Pacific proposal.

2.2.1 Alberta-Pacific Forest Industries Inc.

Alberta-Pacific argued that it had completed a high quality, satisfactory EIA and had addressed the various deficiencies identified by Alberta Environment and Environment Canada in its written responses prior to the start of the hearings.

Alberta-Pacific indicated that it had met all existing requirements of Alberta Forestry, Lands and Wildlife and had expended considerable effort to communicate with all interested and affected individuals and groups prior to the hearings. The company also believed it had exceeded the standards set by EIAs which had been prepared for all previous Alberta forestry projects. It spared no effort to participate in the hearing process by having staff and consultants available for each hearing, responding to requests for additional information, continuing to meet with concerned parties, and co-operating throughout the process.

Alberta-Pacific indicated that it was concerned that the requirements for the EIA and the project changed during the process and that some government environmental standards were being modified even as the hearings were in progress. The public raised water-related issues which covered more than the part of the Athabasca River immediately adjacent to its project. The public raised questions about the cumulative effects of other users of this and other area rivers and demanded information and studies which were not Alberta-Pacific's responsibility.

Alberta-Pacific took the position that it was proposing state-of-the-art but proven technology and a unique project that would meet or exceed all current regulations, would not endanger the environment and would bring substantial economic benefits to the local area and the province. The company said that its plans were world class in all aspects of the project, environmentally sensitive and that it was committed to protect the environment and be a trustworthy steward of all the public resources. Alberta-Pacific promised to work with governments and other users of the river to protect it.

Recognizing government and public concerns, Alberta-Pacific commissioned a series of extensive studies by independent consultants that evaluated the best approaches to technical, Aboriginal and environmental issues. Alberta-Pacific also visited pulp and paper plants around the world to examine and select the best technologies. It indicated that it would likely add a paper mill in the future which would further increase economic benefits to the area.

Alberta-Pacific stated that approximately 50 per cent of the proposed Forest Management Agreement (FMA) area was commercially productive forest land and that clear-cutting blocks would be small (25-60 hectares)—protecting wildlife, critical habitats and plant diversity. Only as much wood was to be harvested in each year as was being regenerated. The company also promised to work with local Aboriginal People and other forest users in planning their operations in the FMA to protect all interests.

In describing its planned timber harvesting, Alberta-Pacific stated:

> *"Timber Management in the proposed FMA is not a land clearing and land use conversion enterprise, but is a forest harvesting operation with rapid forest renewal.*
>
> *The activities of all operators in the proposed FMA will occur on about 1/2 of 1 percent of the productive forest land base, or approximately 1/4 of 1 percent of the total land base per year. These figures include areas to be harvested for the proposed pulp and paper mill and sawlog operators.*
>
> *....to harvest all the commercially productive forest land base (less Reserve Areas (30%)) u ill take about 125 years...."*

Alberta-Pacific recognized people's concerns regarding chlorinated organic compounds (organochlorines) which are produced as byproducts of the bleached kraft process. It stated that the proposed plant, coupled with monitoring, emergency response capability and management plans, would protect the river by releasing well-treated effluent that did not contain measurable amounts of toxins. Water supplies and personal or commercial fishing would not be negatively affected. There would be virtual elimination of the most toxic chlorinated organic compounds and sufficient dilution of the remaining toxic substances so that there would be no effect on the river.

Alberta-Pacific said its approach to utilizing the forests would not destroy them or the uses which were currently made of them, particularly by Aboriginal People and rural residents. The area farming community would also not be greatly affected. The effects that did occur would be mitigated.

In its final submission on January 15, 1990, Alberta-Pacific summarized its position and noted four general points for the Review Board's consideration. The first point concerned public participation.

> *"....Clearly, the project and its environmental consequences have been thoroughly aired in a public forum.*
>
> *Alberta-Pacific wishes to state again that it has been pleased to justify its project in a forum which has allowed such intense public scrutiny and criticism. In our view, the very fact that this open process has occurred will help guarantee that the project, in both its implementation and operation, will provide for maximum protection of the environment. Through this process Alberta-Pacific has been required to make many public commitments with respect to the environmental viability of this project. Alberta-Pacific expects that in the future, at the time of license renewals and future approvals, it will be called to account for these public commitments. In closing on this point, we wish to reiterate our company's belief that an open public process is the best way to ensure that undertakings by industry to protect the environment will be respected by industry and commitments by government on environmental protection and enforcement will be followed through by government."*

The second point focused on the review process itself:

> *"....We ask the Review Board to note that one year ago, Alberta-Pacific began an environmental impact assessment under a set of rules which amounted to a closed review of certain general aspects of the project by a limited number of government-employed experts. The assessment focused on conventional impacts on water and air, the original scoping being considerably less extensive on socio-economic effects which had traditionally been covered by other more specific legislation such as the Planning Act. Over the course of only a few months, the review of the environmental impact assessment evolved into an intensely public examination of a much broader range of issues by several levels of government and many interest groups and affected individuals.*
>
> *Much of the original EIA documentation and information prepared for review under one set of rules was subjected to an extensive public examination and detailed criticism premised on a different set of ground rules. However, we assert that Alberta-Pacific has been able to respond to these changing ground rules and to any legitimate criticisms levelled at its assessment. In doing so, the depth of the assessment of the important environmental issues have been enhanced. However, in terms of fairness to Alberta-Pacific, it would not be reasonable to make adverse findings or recommendations specific to the project given the ever changing set of rules and standards which, in some cases, had still not been established by government regulators at the close of the submissions to the Review Board. Therefore, in order for Alberta-Pacific to be treated fairly, we ask the Board to consider carefully whether your process recommendations should apply only to future projects and should not be applied retroactively to this project."*

The third point related to government and regulatory matters:

> *"In a related comment, we do believe that the process has pointed out very clearly the need for government which claim to have regulatory responsibility for protecting the environment, to be consistent in project review processes and also to communicate clearly and candidly to industrial proponents during all phases of EIA review processes as to their expectations for environmental protection. It would also be useful for governments which promote public processes for the environmental review of industrial proposals to make an equivalent effort to participate fully and effectively in such processes...."*

The fourth point touched on timing:

> *"In closing this submission, we wish to make a point on the critical issue of timing for this project. As the Review Board is well aware, our timetable has been considerably extended from the initial plan. While this is the new reality for industrial proponents in an era of increased public sensitivity to environmental concerns, our economic viability was based on the original planned start-up date. However, delays increase costs and affect the overall economic viability. We wish to make it clear that any conditions or requirements which might delay the project beyond a construction start in late Spring would seriously jeopardize the economic viability of the project and would be unfair to the Proponent. We ask the Review Board to keep this vital concern of Alberta-Pacific in mind in making its final recommendations."*

Alberta-Pacific submitted that its project meets the test for environmental acceptability and stated:

> *"....Our plant will be environmentally safe and will maximize protection for all elements of the environment which will be affected now and in the future. We wish to remind the Review Board that this project has been consciously designed to be retrofitted for new measures which may be developed in the future and which may further enhance environmental protection."*

2.2.2 Government Departments

Canada

The Federal Department of the Environment (DOE), the initiating department under the federal Environmental Assessment and Review Process (EARP Guidelines Order), and the Department of Fisheries and Oceans (DFO) stated from the outset of the hearings, and concluded after a re-examination of the hearing information, that the Alberta-Pacific EIA and related documents were deficient. They said *"....there continues to be insufficient information available to assess fully the environmental impacts resulting from the proposed Alberta-Pacific mill and the cumulative impacts resulting from the proposed and existing mill developments on the Peace and Athabasca river systems...."*

They identified six areas of concerns:

1. potential negative impacts on Wood Buffalo National Park and on the Athabasca River Basin;

2. doubt that dissolved oxygen (DO) in the Peace and Athabasca river systems can be maintained at concentrations that would fully protect all aquatic life;

3. concern about the ability of waste treatment and effluent systems to deal with chlorinated organic compounds;

4. concern about the impact of mill effluents on fish and fish habitat;

5. concern about air emissions from the proposed mill and the lack of local atmospheric baseline data; and

6. concern that the general lack of baseline data on the entire river system makes it impossible to assess or predict cumulative impacts at this time.

The federal government departments' conclusion in their final submission to the EIA Review Board, submitted on January 15, 1990, summarized their arguments:

> *"Based on these concerns and information deficiencies the Department of Environment and the Department of Fisheries and Oceans conclude that the environmental impacts*

of this project alone, or cumulatively with the potential impacts of the existing or proposed pulp mills on the Peace and Athabasca River system, cannot be determined at this time. DOE and DFO therefore recommend that the mill should not be approved until all data and information necessary to assess fully the environmental impacts of the proposed mill have been gathered and evaluated, and the significance of the predicted impacts determined. This information could also be useful if necessary to provide pre-development data for monitoring programs, to assist in the development of an environmental protection plan."

During the course of the hearings, the Federal government reported its intention to *"outline and define the Federal government's regulatory requirements as pertain to pulp mills."* These requirements are still under review but the Pulp and Paper industry has been notified about the intended, stricter water quality guidelines. According to Environment Canada, these are to lead *"toward the virtual elimination of chlorinated dioxins and furans from pulp and paper mills"*.

Alberta

Alberta Environment co-ordinated an interdepartmental identification of information requirements for the EIA and then reviewed Alberta-Pacific's EIA, submitted on May 11, 1989. That review identified a large number of issues which needed to be further addressed. Alberta-Pacific submitted supplementary material on August 30, 1989 which was also reviewed by Alberta Environment. Alberta Environment then concluded that the EIA could go forward to public review. During the hearings, Alberta Environment officials questioned Alberta-Pacific regarding various issues in the EIA, filed information relevant to the proposed project and answered questions posed to it by the Review Board and the public.

Alberta Environment in its overall conclusions indicated that while many of the issues raised by government initially had been addressed by Alberta-Pacific, a number of issues were outstanding. These included:

1. the concern regarding the effects of effluent discharge on aquatic life, particularly in the Peace-Athabasca Delta;

2. the lack of baseline information on fisheries in the Athabasca River between Athabasca and Fort McMurray;

3. the lack of on-site meteorological data, casting doubt on the analysis of odour frequency and detection;

4. doubts about the site selection process and whether or not the site chosen is the best from an environmental perspective; and

5. the lack of information on construction camp operations and the associated impacts.

Alberta Environment did not take a position on whether or not this project should proceed. It asserted that if the project went ahead, it and all other existing or proposed projects would not be allowed to endanger the rivers, aquatic life or human health. Alberta Environment would await the Review Board's decisions but was also reviewing its standards and improving its enforcement and monitoring.

Alberta Environment stated in its final submission to the Review Board on January 15, 1990 that it will be setting more stringent mill specific standards for Adsorbable Organic Halides (AOX), a measure of chlorinated organic compounds in order to reduce them *"...to an absolute minimum or eliminate them if possible."* Minimum dissolved oxygen standards in the river are currently set at 5 milligrams per litre (mg/L) but are under review, and Biochemical Oxygen Demand (BOD) standards will be set to achieve that goal. Mills that violate the standards will be closed.

Certain other Alberta government departments, such as Alberta Transportation, participated in the hearings but took no position respecting the proposed project. They simply described what their roles would be if the project proceeded.

Northwest Territories

Representatives from the government of the Northwest Territories participated at a number of the hearings. They assembled a team of consultants to assist them in presenting their concerns to the Review Board. They summarized their position as follows:

> *"....Our position throughout these hearings has been that current levels of chlorinated organic compounds being found in fish in the Peace, Athabasca and Slave Rivers provide cause for concern. Given the possible magnitude of the effluent loading of these substances to be generated by ALPAC's proposed mill, our position has been that no new sources should be licensed until we are sure that the additional loadings can be accommodated by the system. We, therefore called for zero discharge from the ALPAC mill."*

Alberta-Pacific and the Government of the Northwest Territories disagreed regarding each other's calculations of discharges of chlorinated organics and the Government of the Northwest Territories revised its figures in its final submission. However, the Northwest Territories concluded its revision with the statement:

> *"....The change in number does not affect the substance of the submission of the Northwest Territories."*

In its submissions to the Review Board, the government of the Northwest Territories also emphasized that no approval for the Alberta-Pacific project be given *"until a formal transboundary water agreement or a detailed interim memorandum of understanding"* be signed by all the governments involved. Part of any such agreement would also need to include a monitoring system to address cumulative effects of all upstream industrial developments.

Local Governments

Representatives of several local governments attended the hearings. Those downstream of the proposed project, particularly the City of Fort McMurray, were uniformly concerned with water quality and the possible effect of water contamination on human health. They also were seriously concerned about the possible effects of contamination on aquatic life and other forms of life dependent on the river. These bodies called for more information on the existing conditions and on the possible impacts of all pulp mill projects. They also wanted more information on protection systems on-site and in the river systems, on how taste and odour of water and fish would be affected, and assurances regarding how accidents would be handled. All called for a moratorium or delay in pulp mill development until their questions were answered. They also wanted to be part of the discussions regarding the rivers and their management.

Local authorities in the proposed project area were generally supportive of the project as long as it was found to be environmentally safe. They believed that Alberta-Pacific had demonstrated that it would take all necessary actions to maintain the environment in a safe manner. Increased local employment, and local economic and tax benefits were the key reasons for local government support.

Presentation made to the EIA Review Board in Fort Resolution, N.W.T.

Aboriginal Governments

Leaders of a number of Indian Bands in the vicinity of the mill, in the FMA area, and from downstream communities appeared before the Review Board. They raised many questions about the mill approval process, its possible environmental, economic and social impacts, and the effects of this and other projects on the existing treaties and pending land claims.

These leaders requested a moratorium or delays in approving the Alberta-Pacific mill and other pulp mills currently under construction. They argued that they needed to be included in the planning, assessment, operation and management of the proposed industrial uses of their lands and resources. They also requested resources so that they could participate as equals with other parties.

Most of the Aboriginal leaders feared that their existing traditional ways of life were under serious threat. These forestry projects, they believed, could constitute a death knell for them with few, if any potential benefits. A few Aboriginal leaders expressed qualified support for the project because of the potential for jobs for their people.

2.2.3 Other Participants

All participants, regardless of their views, indicated that there should be no project if it were demonstrated to be environmentally unsafe or destructive of regional rural or Aboriginal life.

These other participants can be roughly divided into those in favour of the project as proposed and those against it. For the most part, the issue was not a choice between development and no development, but whether the proposed development was appropriate or sustainable, whether the timing was appropriate and whether or not the employment and other benefits generated outweighed the costs.

Some participants also had a variety of other concerns which affected their views of the Alberta-Pacific project. Issues were raised such as the effects on global environment, effects on wildlife and wilderness, the pollution effects of other pulp mills, the effectiveness of Alberta's non-energy project approval process, and about Aboriginal rights and land claims.

Hearing in Fort Chipewyan, Alberta. Despite frigid temperatures, more than 285 people attended during the two days.

Participants in Favour of the Project

Those participants in favour of the project included a number of organizations of business leaders, spokespersons for numerous citizens, and individual residents of the area. They generally took the position that Alberta-Pacific was proposing a first class development in an area of Alberta that needed it because of high unemployment. They accepted the EIA and the additional responses to deficiencies and undertakings produced by the company and its

consultants as high quality work which reasonably answered all questions that had been put to the company. They also praised Alberta-Pacific for the amount of research work and communication it did with area residents and those critical of the project.

Some suggested that Alberta-Pacific was being treated unfairly compared to other forestry operators in the province or elsewhere in Canada, that more was expected of Alberta-Pacific, and that it was being punished for the past poor performance of the pulp industry. It was also believed that general environmental concerns and problems between government regulatory agencies were improperly being focused on this one company. They believed that Alberta-Pacific was carefully dealing with environmental issues in its proposed development.

Many of these participants believed that the project would bring substantial economic benefits to their region and to Alberta, and that the company could adequately mitigate any negative effects of the development. Some took the position that other polluters should be punished and that this model project should get underway. For them the lengthy hearing process and all the public criticism were largely unwarranted and might jeopardize the project. In effect, they had learned to trust Alberta-Pacific and they counted on their governments to provide the controls to ensure safe development.

A few Aboriginal leaders supported the project and stated that it should go ahead if Aboriginal participation were increased in employment and business and in monitoring and management. They also emphasized the need for more consultation and funding arrangements to make that consultation effective.

Participants Either Against the Project or Desiring a Delay

The majority of presentations and written submissions were entirely or partially against the project or some major part of it. Many of these participants argued for a delay of pulp mills until a number of basic issues had been answered. Those critical of the project frequently objected to the exclusion of the FMA from the Review Board's terms of reference. They also questioned the scheduling of the hearings, the number of locations, the time allowed for participants to review new or additional information, and the funding arrangements for participants provided by governments.

Those residents living close to the site of the proposed mill and opposed to it stated that the site selected was not appropriate because good agricultural land was being affected. It was a site with high environmental and social impacts. Other non-agricultural sites were available within the FMA and should be considered.

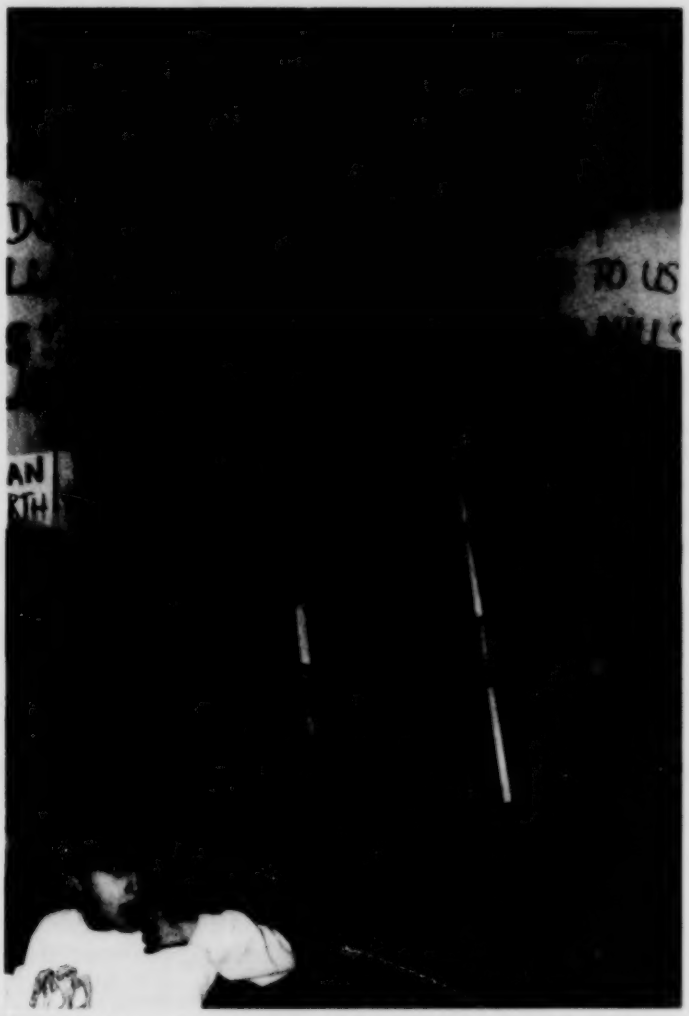
They also objected to the way the government and the company introduced the project. From the beginning it had brought division into this close-knit agricultural community. They believed that they were left to fight for information and for a hearing process to review their legitimate concerns.

Some of the issues highlighted by these participants included: possible effects on agriculture and the viability of their community; effects on the Pine Sands Natural Area; impacts of the construction camp operations; impacts of the proposed road and rail developments; water and air contamination; impacts on the soil and crops; traffic impacts during construction and mill

operations; social and economic impacts on their area and region due to this mega project; and the impact of the mill effluent on the Athabasca River.

While a large number of residents living in the general Athabasca area were in favour of the project, many who appeared at the hearings were not. They argued that insufficient information existed on many key project-relat issues and that an insufficient analysis had been done on this project. They believed that the dollars and loan guarantees provided to Alberta-Pacific were not a wise use of taxpayers' money.

Some of the issues raised by those in the general area included: the lack of water quality data on the Athabasca River and its tributaries; the lack of data on the fisheries including fish habitat; the lack of inventories of the forest's flora and fauna; the lack of data on the health characteristics of the local population and on the negative health effects of chlorinated organic compounds; the lack of studies documenting the potential effects of the logging operations on land, surface and ground water, wildlife, plants, the rivers and existing users of the forest; the lack of consideration of alternative uses of the resource; the lack of consideration of the tourism alternative; and the lack of any publicly available cost-benefit analysis.



School children attending the hearings in Fort Smith, N.W.T.

Almost all participants from Northern Alberta and the Northwest Territories, Aboriginal and non-Aboriginal, were opposed to the project or called for a moratorium. They argued that too little was known about the possible impacts of the proposed mill and other existing mills or those now being built. Some believed they knew enough about the impacts and that they were unacceptable. In particular, participants were worried about water quality and toxic substances that could be put into the entire Athabasca River system. These substances could be introduced both from operations and from accidents.

Since many northeners use the river for drinking water, possible contamination represented a health issue. They raised questions about contamination of fish-

eries and other wildlife and the impact on Aboriginal People who utilize the rivers for country food and for commercial fisheries. Many Aboriginal People worried that not only would their way of life be destroyed, but they would not be able to pass on their heritage to their children. It could also jeopardize the area for any tourism potential.

Most Aboriginal People were opposed to the mill because none of the existing, developing or proposed mills in Alberta had taken their interests into account. They were not partners in development and were largely ignored. Yet as people who lived on the land and used it, people who utilized the rivers and people covered by treaties, they were greatly affected by these projects. In fact their spirituality, hunting, fishing, trapping, berry picking and medicine gathering—their whole integrated way of life—was being threatened.

Most of those from Aboriginal communities in or near the FMA said that the project should not go ahead as planned because it constituted too great a threat to the environment and to their subsistence resource base, and it threatened the Aboriginal way of life. They were concerned that this project affected their treaty rights. They were not satisfied with the company's communication with them and did not feel comfortable with their understanding of the project and its implications. They indicated that they were prepared to talk and negotiate with the company and that perhaps some workable arrangements were possible in the future.

These northerners generally were against the project at this time and until a number of conditions are met. They wanted comprehensive water quality and fisheries data on the entire Athabasca Basin system. They wanted to be part of designing those studies, reviewing them, and participating in a management structure to oversee these waters in the future.

All participants from a variety of organized environmental groups seriously questioned the project. They said that insufficient information existed on water quality, the potential impacts on the rivers in the whole basin, on Aboriginal People and their lifestyles, on the forest itself, on fisheries and fish habitats, on social and economic impacts, on human health, and on the impacts this and other projects like it would have on the environment.

They generally stated that this project was an out-dated use of the resource and that other, less polluting alternatives had not been studied. For them the chlorine-based bleaching processes should be eliminated and the emphasis should turn to methods of manufacturing pulp that did not employ bleach; to recycling and conservation; to environmentally friendly uses of the forests; to tourism and other low environmental impact activities.

They often referred negatively to foreign ownership and challenged the record of Alberta-Pacific's owners on environmental matters. They also called for stricter standards, more monitoring, more enforcement and more severe punishment of polluters.

Some participants opposed to the project came from communities with existing pulp mills. They described negative experiences with these mills with regard to air and water pollution and claimed that governments failed to monitor adequately, to enforce existing standards or to punish violations.

A number of health services professionals came to the hearings either as individuals or as representatives of organizations. With few exceptions, they stated that the project should not go ahead until there was both a baseline health study in the project region and commitment to eliminate toxic materials from the mill effluent. They also requested more analysis of the rivers in the area from a public health standpoint.

3. The Issues

The principal issues considered by the Review Board were derived from the terms of reference. They focused on environmental or social impacts that would likely result from the proposed project, possible mitigative measures, and the resulting environmental acceptability of the proposal. These issues are categorized as follows:

- Effluent discharge to the Athabasca River including cumulative effects on the Peace-Athabasca River systems and resulting impacts on downstream water quality in Alberta and the Northwest Territories, on Wood Buffalo National Park, and on fisheries.

- Effects of timber harvesting on Indian Reserve Lands including those on hunting, trapping and fishing, as well as socio-economic concerns.

- Effects of the mill on the area surrounding the proposed site, including matters such as the site selection criteria, emissions to the atmosphere, and socio-economic impacts.

- Other matters, including some within the terms of reference such as possible effects on navigable waters, and some beyond the terms of reference, but where the Review Board wishes to comment, such as recycling.

The Review Board also assessed and presents in this report, its views of:

- The effectiveness of responses to citizens' concerns and of the EIA review process which was used.

Presentations underway in Athabasca, Alberta, where more than 1,200 people attended during the four days.

4. The Effects of the Mill Effluent on the Athabasca River

Several components of pulp mill effluent were of particular concern to participants. In particular, toxic chlorinated organic compounds (organochlorines) were mentioned many times, and dissolved oxygen was mentioned very frequently. Several experts made presentations on these topics, on behalf of government agencies, Alberta-Pacific, and environmental groups.

4.1 Chlorinated Organic Compounds

4.1.1 Background Information

Chlorinated organic compounds have been of widespread public concern for over two decades. All are a result of manufacturing processes and do not occur naturally. Some are extremely toxic, and some are both persistent in the environment and biomagnified as they are passed up food chains. The term organochlorines includes many of the pesticides manufactured in the mid 20th century, plus a number of compounds accidentally produced as a "side effect" of manufacturing, such as dioxins, furans and PCBs.

Of concern with respect to pulp mills are dioxins, furans, chlorinated phenols, and 300 to 1,000 other chlorinated organic compounds. The toxicity and other properties of less than 30 of these are known, but a few of those that have been studied are very toxic.

The presence of dioxins and furans, two of the most toxic types of chlorinated organic compounds, was first discovered in the effluents of bleached kraft pulp mills in 1985. The compounds have been found in the effluents of most older mills of this type, as well as in receiving waters below almost all older bleached kraft mills. The source of these compounds and most other organochlorines was discovered to be the chlorine bleaching process, where high concentrations of lignin and other organic materials dissolved from wood fiber are exposed to high concentrations of chlorine. Some defoaming agents were also implicated, but have since been eliminated by the industry. Since the discovery of dioxins and furans in effluents of bleached kraft pulp mills, the pulp and paper industry has made great progress in reducing their formation by using oxygen delignification, extended pulp cooking, substitution of chlorine dioxide for chlorine in the bleaching process and by more complete secondary treatment of effluents before discharging them to natural waters.

4.1.2 Toxicity, Bioaccumulation and Persistence

Toxicity

The dangers of chlorinated organics result from a combination of several factors. Some of the substances are toxic at extremely low concentrations. The most toxic of dioxins, 2,3,7,8-TCDD, is produced in significant quantities by older bleached kraft mills. It is widely reputed to be the most toxic substance ever manufactured. Information presented at the hearings by Dr. Lyle Lockhart of Fisheries and Oceans Canada (DFO) indicates that other chlorinated organic compounds are less toxic. The furan of concern from bleached kraft pulp mills, 2,3,7,8-TCDF, is considered to be 10-fold less toxic than 2,3,7,8-TCDD, although its concentrations are also usually about 10-fold higher.

Many chlorinated organic compounds occur together in pulp mill effluent. Based on mammalian toxicity testing, effects appear to be additive, or possibly even synergistic (greater than additive). In some cases, toxicity is increased under low oxygen, or tolerance of fish to low oxygen is impaired when organochlorine contaminants are present. Because low oxygen may be a problem in the Athabasca River in winter, this interaction is a matter of concern (Section 4.2).

Although dioxins and furans are known to be many times more toxic to animals than PCBs, most studies of toxicity to humans have focused on PCBs. Dr. W. Swain, representing the Government of the Northwest Territories, indicated that characteristics of the compounds are otherwise similar enough that effects should be comparable, if the differences in concentration and toxicity are accounted for. The effects of organochlorines on humans, predicted by correlation of several factors with PCB concentration in human tissue, appear to be manifold, including physical, neurological, behavioural and reproductive anomalies. Dr. Swain also pointed out that although correlations of health effects were done with PCBs, the human populations studied were also contaminated with a number of other organochlorines, including dioxins and furans. As a result, PCBs should be regarded as merely an index of organochlorine contamination, that is, the observed symptoms were probably caused by a mixture of dioxins, furans, PCBs and other organochlorines.

Some participants stated that there was no direct evidence that dioxins or furans were harmful to humans. However, no reference was made in these presentations to studies on humans done in the past three years. The scarcity of direct evidence of harm to humans may be due to the fact that there are no controlled long-term experiments using humans, and few long-term epidemiological studies. The Board received written references to two scientific studies published in late 1989 which indicate that dioxin exposure has caused increased cancer rates at several sites in humans, and a recently-published study linking increased cancers of the digestive tract and lymph system in pulp and paper workers to organochlorine exposure. The similarity of the effects that organochlorines are alleged to have on humans, based on correlative evidence, and effects proven experimentally in studies of fishes, birds, reptiles and other mammals is cause for concern.

The Review Board is also concerned that Health and Welfare Canada's (H&WC) permissible concentrations of 2,3,7,8-TCDD in fish for human consumption, 20 parts per trillion (ppt), are based on assumed rates of fish consumption that are far lower than those of Aboriginal Peoples

in the lower Athabasca, Slave and Mackenzie River systems. The rates of consumption assumed would allow a person weighing 70 kilograms to eat only an average of 35 grams (slightly more than one ounce) of fish per day. The Board was told that weekly consumption of fish by many Aboriginal Peoples of the above rivers may be more than 10-fold higher than that of average Canadians. As a result, the permissible concentrations of these compounds in fish flesh should probably be correspondingly lower. As Dr. Swain pointed out, the concentrations of PCBs in human blood serum are correlated with the number of years that contaminated fish have been eaten, as well as with the amount of fish in the diet. Similar concerns apply to other chlorinated organic compounds.

The preceding paragraph refers to the Canadian standard for 2,3,7,8-TCDD. It is important to note that for purposes of determining if fish consumption is permissible, the 2,3,7,8-TCDF concentration is multiplied by 0.1 (to account for differences in toxicity) and this is usually added to the 2,3,7,8-TCDD concentration.

There is general agreement in the scientific community that human exposure to dioxins and furans should be kept as low as possible. In particular, the high toxicity of 2,3,7,8-TCDD to test animals has caused some jurisdictions to adopt standards that are more stringent than Canada's. For example, the Board received evidence that some jurisdictions may be using a guideline in the neighbourhood of 1 ppt as the permissible concentration for consumption of fish, compared to the Canadian standard of 20 ppt. Also, the United States Environmental Protection Agency (EPA) criteria for water quality is currently 0.013 parts per quadrillion (ppqd or 13 parts in 10^{15}). This water quality value has been adopted by the state of Oregon as the ambient water standard for state waters. Apparently, Canada does not have a water quality standard.

Bioaccumulation

Chlorinated organic compounds are concentrated in the bodies of organisms to varying degrees. Biological concentration factors (BCFs, the ratio of the concentration in organisms to that in water) appear to be high, ranging from a few thousand to over 100,000. BCFs are highly unpredictable, and are not extrapolatable from one situation to the next with confidence. In the words of Dr. R. Willes, appearing on behalf of Alberta-Pacific, "*the variation in the condition of the water from various locations in the real world would be so great that almost any bioconcentration factor desired could be calculated, depending on the particulate matter content of the water when it was analyzed. Such variations in the data used to calculate bioconcentration factors results in values ranging from about 2,000 to as high as 159,000.*" The high BCFs appear to be due to a combination of biomagnification as compounds are passed up food chains, and the lipophilic nature (attraction to fats) of most chlorinated organic compounds. Some of the more toxic compounds are also those that bioconcentrate to the greatest degree.

Information was presented to the Review Board by Drs. Swain and Lockhart that dioxins and furans at very low, even undetectable concentrations in water had been concentrated in organisms enough to cause reproductive failure in predatory fishes such as rainbow trout, and in fish-eating birds such as herons, gulls, terns and cormorants, due to biomagnification in food chains. Concern was expressed, both by the public and by scientific experts, that similar problems could affect eagles, peregrines, pelicans and other predatory birds, as well as humans.

Scientists from DFO indicated that, despite the fact that 2,3,7,8-TCDD is undetectable in effluents from bleached kraft mills on the Fraser River, the compound is being accumulated in fish of the Fraser below the mills. Studies conducted by DFO at Prince George and presented by Dr. Lockhart indicate that salmon and whitefish exposed to even these low concentrations had dioxin concentrations approaching H&WC limits, and furan concentrations of up to 290 ppt. The salmon showed elevated liver enzyme activities, decreased tolerance of low oxygen, and various histological changes related to bacterial kidney disease.

Persistency

Many chlorinated organic compounds are extremely persistent in the environment, especially when they are not exposed to light, as in sediments of lakes or rivers. Some are degraded only very slowly by bacteria, probably because of their high toxicity. Alberta-Pacific's final submission suggested that photodegradation would be rapid, based on studies of the compound in small vessels exposed to direct sunlight. However, the low penetration of ultraviolet light into turbid rivers and the fact that most organochlorines entering the aquatic environment are quickly transferred to sediments or to organisms, would probably render this mechanism ineffective in nature. Also, studies in more natural systems suggest that degradation of many toxic organochlorines is slow.

Many organochlorines are excreted only slowly by organisms once they are incorporated. Also, in bottom muds, organochlorines concentrate and are inactivated primarily by burial. Sediments are resuspended and carried downstream during periods of high water flow. For example, Dr. G. Dixon told the Board that sediments of the Fraser River are contaminated for 500 km below pulp mills.

Based on the long time required for significant reductions in organochlorines to occur following past cleanup attempts (for example, Mirex and PCBs in the Great Lakes), it can be assumed that some toxic organochlorine compounds discharged from pulp mills may require decades to disappear from contaminated aquatic systems or food chains. It is the Board's conclusion that it is preferable to prevent the systems from becoming contaminated in the first place.

As mentioned above, dioxins, furans and many other organochlorines have long residence in the bodies of many animals, including humans, and high affinity for fats. As a result, some organochlorines can be passed from one human generation to the next with high efficiency, due to the high fat content of reproductive material and mammalian milk. This point was graphically demonstrated in the presentation of Dr. Swain with respect to the expected rate of elimination of PCBs from humans. Reflecting on the probable organochlorine concentrations in future generations, Dr. Swain said: *"Let's assume that I can somehow magically today cut off all sources of polychlorinated biphenyls (PCBs) to my daughter...based on normal transmission through breastfeeding and through transplacental transmission of the PCB molecule, I will be able to measure PCB in the body fat of my great, great, great, great granddaughter. Six generations into the future."*

Of particular concern to the Review Board is that very few of the hundreds of organic compounds in pulp mill effluent have been studied for toxicity, persistence in the environment, and possibility of synergistic adverse effects on either natural ecosystems or humans.

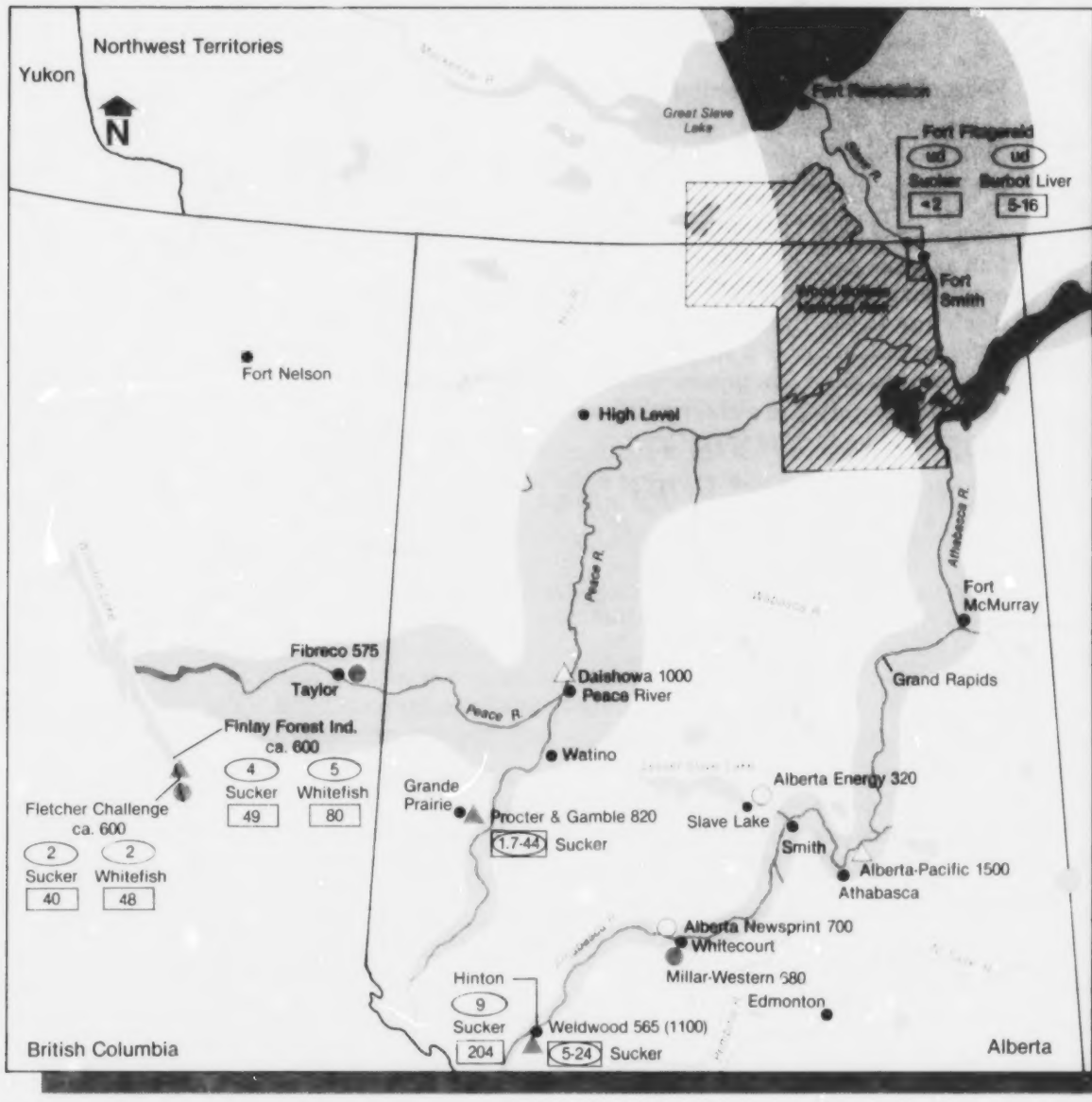
Federal government scientists presented results of sensitive sublethal bioassays for a number of different chlorinated organic compounds. These are regarded as more sensitive and more indicative of chronic low-level effects than short-term bioassays based on the survival of whole organisms. Results suggest that some of the compounds emitted from pulp mills in addition to 2,3,7,8-TCDD and 2,3,7,8-TCDF are also rather toxic. According to Dr. Lockhart, organic components from pulp mill effluents may also activate the same protective enzyme systems in fish as some pesticides and petroleum pollutants, so that additive or synergistic effects might occur with pollutants originating from agriculture, oil sands or other human activities that discharge to the river. In the words of Dr. Gordon Craig, presenting for Alberta-Pacific, *"it (enzyme induction) is a metabolic response...*(which occurs) *with many other compounds...like DDT and PCB...a low exposure will induce the enzyme system."* This suggests the possibility that a combination of airborne and water-borne organochlorines are adversely affecting fishes and should be further investigated.

The large number of chlorinated organic compounds, the unknown nature of their combined toxicity and the unpredictability of their bioaccumulation, persistence and other properties in the environment, has led some jurisdictions to recommend that all human activities producing chlorinated organic compounds be phased out as rapidly as possible. Examples presented to the Review Board included the International Joint Commission's Scientific Advisory Board 1989 report for the St. Lawrence Great Lakes Basin, and several references to long-term plans in Sweden. The above-mentioned uncertainties regarding organochlorides lead the Review Board to conclude that extreme caution should be exercised in dealing with facilities, such as the proposed mill, which would emit significant amounts of organochlorines.

4.1.3 The Present Concentrations in the River System

Documents respecting contamination of fishes with 2,3,7,8-TCDD and 2,3,7,8-TCDF by pulp mills on the Peace and Athabasca Rivers were presented to the Review Board by DOE, DFO and Alberta Environment. Similar information was presented for other mills in British Columbia, eastern Canada, and Sweden. Some other participants presented data for a few sites on the rivers, but the combination of compounds presented were not indicative of pulp mill effluents. Mr.Noton of Alberta Environment, in a 1989 review of chlorinated organic compounds, listed Alberta Forestry, Lands and Wildlife as among agencies that had conducted organochlorine studies on the river system, but the Review Board did not receive information directly from that agency.

Dioxin and furan concentrations for sites on the Peace-Athabasca-Slave River system are compiled in *Figure 4.1, Existing, Under Construction and Proposed Pulp Mills*. It is noteworthy that no studies were presented for fishes or other samples from long (several hundred kilometre) reaches in the mid-sections of either the Peace or Athabasca Rivers.



Existing Pulp Mills

▲ Kraft

● CTMP

565 Pulp capacity (t/d)

Proposed or Under Construction

△ Kraft

○ CTMP

(1100) After expansion

Width of band on selected rivers indicates mean annual discharg

Dioxin and Furan in Fish ppt.

(x x) 2, 3, 7, 8 TCDD

[x x] 2, 3, 7, 8 TCDF

⬭ Combined toxicity of 2, 3, 7, 8 TCDD and TCDF*

*Equal to 2, 3, 7, 8 TCDD plus 0.1 x 2, 3, 7, 8 TCDF as ppt.

Figure 4-1

Existing, Under Construction and Proposed Pulp Mills in the Peace and Athabasca River Basins January, 1990

The Athabasca River System

The Weldwood bleached kraft mill at Hinton has been discharging dioxins, furans and other chlorinated organic compounds to the Athabasca River for many years. Concentrations in fish in the vicinity of the mill have been reported by Alberta Environment as combined 2,3,7,8-TCDD and 2,3,7,8-TCDF in suckers using a toxicity equivalency factor (TEF) of 0.1 for TCDF. However, DFO analyses for fish of the same site separate the two compounds *(Figure 4.1)*. 2,3,7,8-TCDD was reported at 9 ppt, which is about one-half of existing standards. However, 2,3,7,8-TCDF was reported at 204 ppt. If one uses the rule of thumb that it is about one-tenth as toxic as 2,3,7,8-TCDD, both studies show that the concentrations are already over the equivalent of permissable limits of 20 ppt for human consumption as set by H&WC. Invertebrates and sediment have also been contaminated.

In view of the poor characterization of toxicity for these and related organochlorines, the great variability in the few samples analyzed, and the absence of data for several hundred kilometres below the mill, the Review Board regards concentrations as high enough to be of considerable concern. The Alberta Newsprint mill under construction at Whitecourt and the Alberta Energy mill under construction on the Lesser Slave River are of the Chemi-Thermomechanical Pulp (CMPT) type. Because they do not use chlorine bleach, they are not expected to emit organochlorines. They will, however, contribute to biochemical oxygen demand (BOD) (Section 4.2), which could exacerbate the organochlorine problem, for low oxygen is known to enhance the toxicity or exposure of fish to organochlorines.

The Peace River System

There are currently two bleached kraft mills discharging into the Peace River system, the Finlay Forest Industries mill in British Columbia, and the Procter and Gamble mill on the Wapiti River *(Figure 4.1)*. The Daishowa mill under construction near the town of Peace River is also to be of the bleached kraft type. Similar to the situation at the Weldwood mill on the Athabasca, significant concentrations of dioxins and furans have been found in fish taken near the existing mills. Concentrations of 2,3,7,8-TCDD were relatively low, but for 2,3,7,8-TCDF averaged 40 to 80 ppt in whitefish and sucker near the Finlay Forest mill. Concentrations of 2,3,7,8-TCDD and 2,3,7,8-TCDF in fish below the Procter and Gamble mill on the Wapiti were as high as 309 ppt for 2,3,7,8-TCDF, and the total combined concentrations, using the one-tenth rule of thumb to convert 2,3,7,8-TCDF to its 2,3,7,8-TCDD equivalent, is about 44 ppt *(Figure 4.1)*. According to Mr. Noton of Alberta Environment, invertebrates and sediments of the Wapiti and Smoky Rivers below the Procter and Gamble mill were detectably contaminated at least as far as Watino, over 120 km downstream on the Smoky River.

There are also two pulp mills of the CTMP type on the Peace River system, the Fletcher-Challenge and Fibreco mills in B.C., which are not expected to release organochlorines *(Figure 4.1)*.

Slave River and Athabasca Delta

Dr. Lockhart of DFO indicated that fishes and sediments of the Slave River have been contaminated with a variety of organochlorines, including furans, chloroguaiacols and chlorophenols. Some of the organochlorines appear to have entered the river by deposition from the atmosphere, while others, most notably chloroguaiacols and 2,3,7,8-TCDF, are likely to have originated from pulp mills on the Peace and Athabasca systems. While 2,3,7,8-TCDD was undetectable in fish (<2 ppt) and concentrations of 2,3,7,8-TCDF were only significant in burbot livers, the combination of organochlorines of all sources, including toxaphene, DDT, PCB, mirex, dieldrin and several other compounds, is high enough to be cause for concern, especially in view of the cumulative nature of organochlorine toxicity, and the small number of samples analyzed.

Due to the high fish consumption by northern Aboriginal Peoples, and in particular their consumption of burbot livers, total organochlorine contamination of the Slave River from all sources is of concern to the Board.

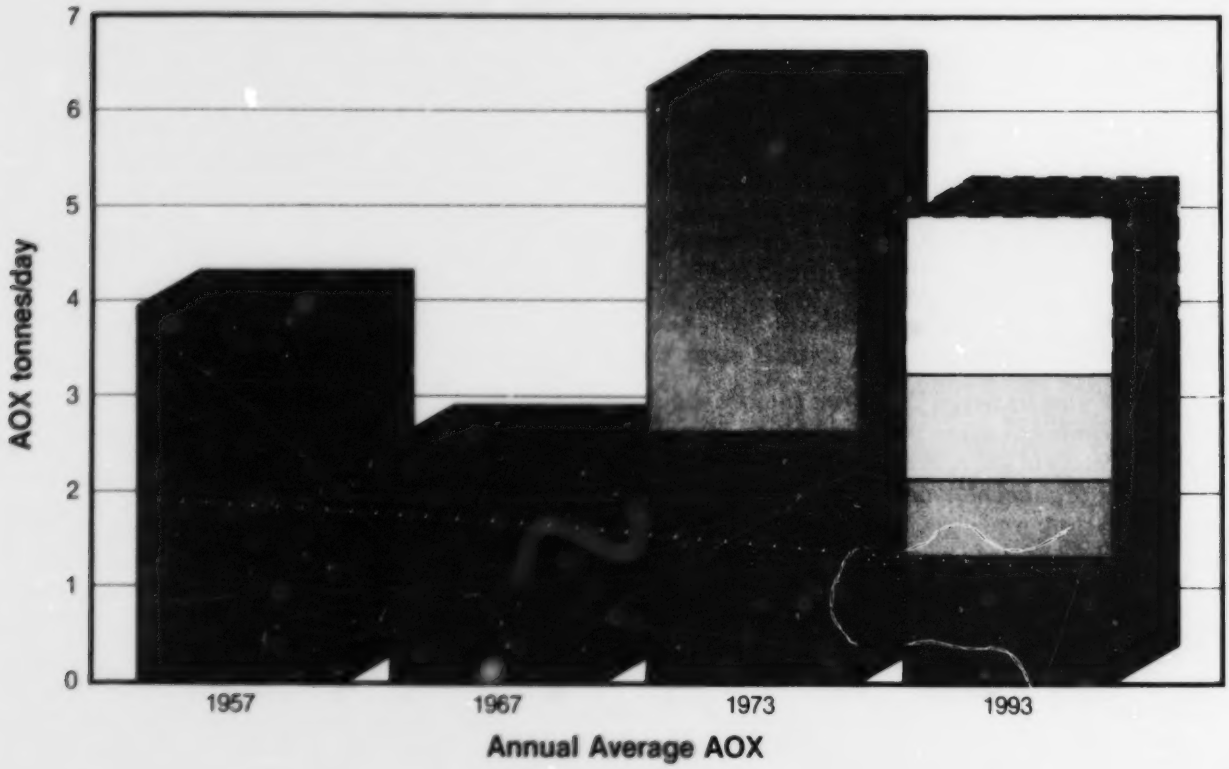
In addition, the concentrations in fish and sediments may still be increasing due to current levels of discharge, for saturation of sediments with organochlorines may require several decades. There are no analyses of fish before 1988, so it is impossible to tell whether concentrations of furans and other organochlorines in fish and other parts of the environment are stable, increasing or decreasing, ie. whether concentrations are at steady-state. In addition, the Daishowa mill, which is of the bleached kraft type is expected to add significant amounts of chlorinated organic compounds to the system as shown on *Figure 4.2, Estimated Discharges of Halogenated Organic Compounds*.

In summary, there are presently significant concentrations of dioxins and furans reported in parts of the Peace and Athabasca rivers near bleach kraft mills, and low levels of furans in the Slave River. Some of the compounds found are indicative of pulp mills. This information coupled with the uncertainty regarding the toxicity and other characteristics of the compounds and the lack of organochlorine data for reaches of the rivers for several hundred kilometres below existing mills, convinces the Review Board that immediate steps should be taken to measure the degree, sources, and rates of increase in organochlorine contamination throughout the river system.

4.1.4 The Alberta-Pacific Proposal

In assessing the potential effects of organochlorides from the proposed mill, there are several important elements. They are the amount and concentrations that will be contained in the effluent, the flow volume of the river receiving the effluent, and the amounts which will concentrate in fish.

In terms of the amount and concentrations in the effluent, Dr. Bruce Fleming, representing Alberta-Pacific, presented calculations based on combining the efficiencies of several treatment processes that have been studied in isolation. These included oxygen delignification, extended cooking, chlorine dioxide substitution and activated sludge treatments. His calculations indicate that it should be possible to reduce dioxin and furan concentrations to values



*AOX = Adsorbable Organic Halides
It is approximately 1.3 times TOCl (Total Organic Chlorides)

Figure 4-2

Estimated Discharges of Halogenated Organic Compounds (as AOX)* to the Peace and Athabasca Rivers From Alberta Pulp Mills

From "Alberta Environment's Commitment" document
Prosperity, Dec. 14, 1989

that are undetectable in effluent from the Alberta-Pacific mill. The Review Board is satisfied that the mill would greatly reduce dioxin and furan concentrations but is concerned that the various processes combined in Alberta-Pacific's calculations have not been previously tested in one combined treatment system. It is thus not known whether the combined treatment will be as efficient as the sum of the various elements. Also, as discussed previously in this section, various studies have shown that dioxins and furans can be bioaccumulated from undetectable concentrations in water to concentrations in aquatic organisms that are toxic to the organisms themselves, or pose a hazard for organisms higher in the food chain, including humans. Thus, even if dioxins and furans are undetectable in effluents, as Alberta-Pacific predicts, there is no assurance that they will not add to contamination of fisheries of the Athabasca River, or waters into which it flows.

It should also be noted that even though the Alberta-Pacific mill will emit a lower concentration of organochlorines in effluent than any other bleached kraft mill in the world. Due to the high capacity of the mill and the smaller size of the Athabasca River, it will still be a significant source of organochlorine contamination. To illustrate, if it is assumed that Alberta-Pacific meets its proposed objectives of processing 1,500 air dried tonnes of pulp per day and emission of 1 kg TOCl (Total Organic Chlorides) per air-dried tonne, once diluted by the river, Alberta-Pacific's contribution of TOCl to the Athabasca will be 0.23 mg/L under low flow conditions. A similar calculation for the Weldwood mill at Hinton, using its expected capacity of 1,100 tonnes/day and TOCl emission of 1.4 kg/ADt after expansion and upgrading, indicates that low-flow concentration of TOCl would be 0.24 mg/L. If one assumes that TOCl behaves as observed in the Fraser River, concentrations below the Town of Athabasca could approach those observed at Prince George, for although inputs of TOCl to the Fraser are much higher, the volume of the river is also much greater than the Athabasca. As mentioned above, a number of adverse effects on fishes have been documented in studies at Prince George. It is also noteworthy that the addition of Alberta-Pacific and Daishowa mills to the Athabasca and Peace Rivers, plus planned mill expansions will almost offset any reductions in organochlorines resulting from improved effluent treatment at Weldwood and Procter and Gamble mills. Alberta-Pacific would be the greatest single source of organochlorines to the river, and the total discharge in 1993 would still be about 80 per cent of highest values in the past *(Figure 4.2)*.

The concentration of chlorinated organic compounds that might occur in fish, water and sediments at sites below the proposed mill were predicted in Alberta-Pacific's final submission. It presented results of a scientific model for predicting dioxin concentrations at various levels in the aquatic food chain downstream from the mill. The concept of the model was suggested by Dr. Muir of DFO, but Alberta-Pacific's model differed from that suggested in several respects. Firstly, Alberta-Pacific's model includes a sediment compartment that is assumed to accumulate all 2,3,7,8-TCDD as soon as it enters the ecosystem. The compound enters the food chain only via bacterial uptake, followed by ingestion of invertebrates in the sediments (benthos). Concentrations in large and small fish were then predicted assuming that fish would be exposed only to concentrations in water. In contrast, Muir's model assumed that 25 per cent of the 2,3,7,8-TCDD in the water would be in solution, which is consistent with observations.

In addition, Alberta-Pacific used coefficients for assimilation and depuration (urination, excretion, defecation, etc.) of 2,3,7,8-TCDD by fish from a 1988 study of Dr. Muir's, but they were for different compounds than those of concern from pulp mills (hexachlorodioxins and 1,3,6,8-TCDD). Values for 2,3,7,8-TCDD, the dioxin of concern from pulp mills, were available

from the literature. In the words of Dr. Muir, in a written critique of the model:

> *"One major reason for the differences between the two models, even when using ALPAC's water concentrations, is that the parameters used by ALPAC for TCDD assimilation and depuration are incorrect...."*

Alberta-Pacific's model predicted concentrations in suckers that were 450 times lower than those actually measured, suggesting major errors in model assumptions. It also predicted that concentrations in large fish would be lower than in bacteria or benthos, which is not consistent with measurements at any location. In contrast, the model presented by Dr. Muir was compared with measured contamination levels near Hinton and pulp mills elsewhere in Canada, and its predictions were reasonably good. As a result, the Review Board believes that Dr. Muir's model is probably more reliable. On the basis of that model, it concludes that contamination of the fisheries of the Athabasca River could be significantly increased by addition of the Alberta-Pacific mill.

One cautionary note is that both Alberta-Pacific's and Dr. Muir's models were designed for steady-state conditions. They assumed that under existing discharges, the river is as contaminated as it would ever become. In the absence of historical monitoring records, it is impossible to tell whether the steady-state assumption is valid, and it is possible that contamination of fishes and other parts of the Athabasca River could increase even if inputs of organochlorines are unchanged. As Dr. Muir pointed out, a dynamic model would be more appropriate, but the food chain and hydrodynamics of the river are too poorly known to allow such a model to be used. The Board concludes that neither model is presently accurate enough to use in predicting the degree of contamination that would be caused by release of chlorinated organic compounds from proposed mills.

4.1.5 Conclusions and Recommendations

Limited data presented to the Review Board indicate that existing pulp mills on the Athabasca and Peace Rivers have already contaminated the fishes, waters and sediments with significant concentrations of dioxins, furans, and other chlorinated organic compounds. Since northern Aboriginal People consume a large percentage of fish in their diets, many participants, including the Government of the Northwest Territories and several experts, believe that values may already be unacceptably high at some sites.

Adding to our concerns is information presented to the Board on recent scientific reviews of more stringent standards in the U.S.A., recent epidemiological studies indicating that 2,3,7,8-TCDD is a human carcinogen, and evidence for increased cancers in U.S. pulp and paper workers. Due to the lack of historical data on concentrations in fish of the Athabasca, it is not known whether concentrations of toxic organochlorines are increasing or not. Also, because sampling for contamination of fishes has been limited to a few fish taken immediately below existing mills on the Athabasca and Peace Rivers and on the Slave River, it is not known to what extent the fishery in most of the river system is already contaminated.

The mill proposed by Alberta-Pacific would be a very modern one, discharging less chlorinated organic compounds per tonne of pulp produced than any other mill in Canada, and perhaps in the world. However, due to the large capacity of the mill and the relatively small volume of the

Athabasca River, the mill could contribute significantly to the already elevated concentrations of chlorinated organic compounds.

The Review Board recommends:

- The Alberta-Pacific bleached kraft mill not be allowed to proceed until further scientific work establishes the origin and degree of fish contamination on the Athabasca-Peace-Slave River system, whether concentrations of organochlorine compounds are stable, and whether the fish and other aquatic life are, and will remain, unimpaired and safe for human consumption.

- A monitoring program to study the current degree of organochlorine contamination in the combined river system should be designed and executed. The program should be managed by a committee including representation from the Governments of Alberta, British Columbia and Saskatchewan, the Federal Government, the Government of Northwest Territories, industry, the towns and cities on the river system, and native communities likely to be affected. The committee should review monitoring results and see that they are made public. They should be involved in the formulation of advice to authorities as to whether a mill could safely proceed. Studies should account for other existing or planned pulp mills, other sources of organochlorines, additive or synergistic effects of various organochlorines and oxygen on fishes, and consideration of future developments in the basin.

- Guidelines for consumption of fishes for human populations in the Mackenzie River Basin should be developed taking into account the specialized dietary habits of Aboriginal peoples and other northerners. These guidelines should be revised as knowledge of effects and concentrations of organic toxins in fishes change over time. If these guidelines show that current contamination of fish is too high given normal rates of consumption by Aboriginal people, some Board Members believe that action should be taken immediately to reduce sources of contamination.

- Existing discharges to the river of chlorinated organic compounds should be decreased as rapidly as practical.

4.2 Dissolved Oxygen (DO)

There are a number of water surface quality guidelines and objectives for dissolved oxygen (DO). The current Alberta water quality objective (ASWQO) is 5 mg/L. However the Review Board heard during the hearings that this standard is under review, possibly to be replaced with a higher value.

Current Canadian federal water quality guidelines (CWQG) are 9.5 mg/L for sensitive salmonid species and life stages. DOE and DFO state in their final submission: *"DO concentrations in the receiving waters must not fall below 9.5 mg/L or a site-specific objective for DO that may be developed based on a sound scientific assessment of the requirements to protect fully the fish and fish habitat of these river systems....A DO objective must...protect the most sensitive individuals of the most sensitive species in the aquatic community, and must include consideration of the synergistic effects caused by pollutants in the water."* They emphasize that existing information is inadequate to construct site-specific objectives.

In the U.S.A., even higher values, 11 mg/L, are required in waters inhabited by sensitive life-stages of salmonids (the group that contains trout, salmon, charr and whitefish), and 8 mg/L are required for other stages of salmonids.

4.2.1 Background and Existing Situation

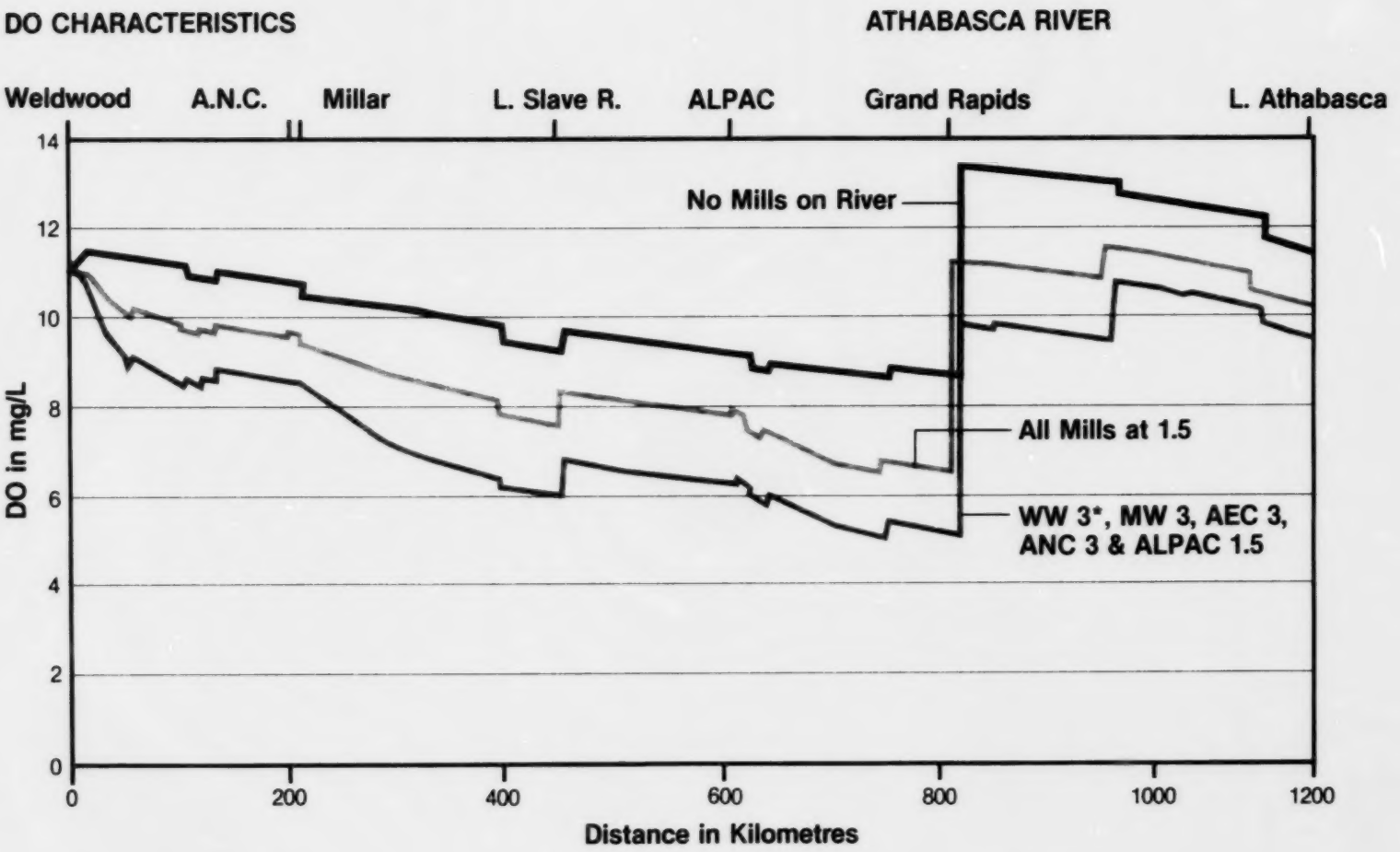
Under ice-free conditions, rivers such as the Athabasca are nearly saturated with oxygen except when polluted with large amounts of organic substances that have a high BOD. The fact that long stretches of the Athabasca River above the Grand Rapids are continuously ice covered for three to five months each winter poses a special problem. The ice prevents the atmosphere from replenishing the supply of oxygen in the river. The river also has extremely low flows in December through March, when it is ice covered. In addition, some tributaries to the Athabasca, for example the Pembina River, have low oxygen contents, probably due to a combination of natural conditions and to inputs of sewage and agricultural runoff. As a result, the oxygen concentration of the Athabasca River is even more depleted below the confluence of the Pembina River and the mainstem of the Athabasca.

On the basis of modelling results presented by Alberta Environment, the CWQG of 9.5 mg/L for sensitive stages of salmonid fishes might not be attainable for some reaches of the Athabasca river, even if no mills were present *(Figure 4.3, Dissolved Oxygen Predicted at 7Q10 Flows Under Winter Conditions)*. No historical surveys were presented, and existing data for the river and its tributaries are insufficient to judge how much fisheries are presently impaired by winter BOD inputs. This view was presented by several participants, and agreed to by Dr. M. Halloran, appearing on behalf of Alberta-Pacific.

Information presented to the Review Board by Dr. Peter McCart, representing the Athabasca Tribal Council, suggested that sensitive life stages of some species of salmonid fishes might be adversely affected by waters containing less than 9.5 mg/L of oxygen. Studies by the U.S. EPA have indicated that 11 mg/L of oxygen is necessary to ensure that reproduction of salmonids is not impaired, and 8 mg/L is necessary for other life stages. High oxygen in water is particularly required in regions where eggs and larval stages inhabit the upper layers of bottom muds, for some of the oxygen diffusing from overlying waters is consumed by decomposition in the muds.

The Athabasca River contains at least 11 species of salmonids, including seven species of trout and charr, two species of whitefish, and arctic greyling in the reach of the river from the site of the proposed mill to Fort McMurray. Although its tributaries are poorly studied, four species of salmonids have been recorded for this reach, chiefly from the tributaries. These are the Rocky Mountain whitefish *Prosopium williamsoni* and the lake whitefish *Coregonus clupeaformis,* plus the arctic grayling *Thymallus arcticus* and the Dolly Varden trout *Salvelinus malma*. All of these species are autumn spawners, so that the life stages requiring high oxygen would occur under ice, at the very time when oxygen in the Athabasca is lowest. This is cause for concern.

The Rocky Mountain whitefish is known to migrate to spawn, both in the region above Hinton and below the Grand Rapids. No information on the stretch of river between Hinton and Grand Rapids was presented to the Board.



WW = Weldwood
MW = Millar-Western
AEC = Alberta Energy Co.
ANC = Alberta Newsprint Co.
ALPAC = Alberta-Pacific

* Numbers are BOD in kg/ADMT

Figure 4-3

Dissolved Oxygen Predicted at 7Q10 Flows Under Winter Conditions

Modified from "Alberta Environment's Commitment" document
Prosperity, Dec. 14, 1989
Predictions using DOSTOC model

Existing pulp mills on the Athabasca River have already stressed the river severely by depleting oxygen under winter ice. In 1988 and 1989, oxygen in winter months barely met the ASWQO of 5 mg/L. According to Mr. Noton of Alberta Environment, in 1989, the more stringent CWQG of 9.5 mg/L for early life stages was violated continuously from Whitecourt to Grand Rapids for several months during this winter. The CWQG of 6.5 mg/L for other stages was also violated for the reach from the Pembina River to Fort Smith. While there are no winter oxygen measurements before 1988, Alberta Environment's calibrated models indicate that the river was probably totally devoid of oxygen for several months in winter from 1957 through 1967, for several hundred kilometres downstream of Hinton, due to high BOD inputs from the Weldwood pulp mill *(Figure 4-4, Mill Discharges of BOD Discharge)*. While there are no records before the installation of the mill, elimination of fish and other organisms in the river would be expected as a result of the lack of oxygen. Although the discharge of BOD from the Weldwood mill at Hinton was reduced by two-thirds in 1967, and even more since that time, it is still the major source of BOD to the river, and it will continue to be the dominant source in future, under the proposed river management plan *(Figure 4.5, Projected Cumulative BOD Discharge (t/d) to the Athabasca River)*. Under this plan, total BOD loading to the river would be increased by 70 per cent over 1988/1989 values—in spite of improved effluent treatment—because of the much greater pulp production by all mills. However, if Alberta Environment's requirement for less than 3 kg BOD/ADt is met, total BOD in 1993 would be similar to that in 1989.

4.2.2 Synergistic Effects of Oxygen and Other Pollutants

The fact that very low oxygen can cause fishes to suffocate is obvious and requires no elaboration. In addition, Dr. Ian Birtwell of DFO presented information suggesting that low oxygen increased the toxicity of pulp mill effluent, and that avoidance of anoxic waters caused fishes below mills in British Columbia to concentrate in overlying waters, which were polluted by pulp mill effluents. As mentioned in Section 4.1, the presence of organochlorines also decreases the tolerance of fishes to low oxygen.

4.2.3 The Alberta-Pacific Proposal and Predicted Changes in BOD Loading from New and Existing Pulp Mills

The Alberta-Pacific mill is predicted to discharge much lower BOD per tonne of pulp than existing mills due to its superior treatment system. Both Alberta-Pacific and Alberta Environment constructed and ran models to predict how changing BOD inputs would affect winter dissolved oxygen concentrations in the river. While Alberta-Pacific criticized Alberta Environment's approach as being too conservative, a comparison of Alberta-Pacific's DO2 and Alberta Environment's DOSTOC model were done by Dr. Louis Schmittroth, representing Friends of the Athabasca. In his words, following a comparison of model predictions and actual measurements: *"....the DO2 program gives predictions that are very much too high....The odds on favorite is DOSTOC, but by how much is open to question."*

In a later submission, Dr. Schmittroth and Dr. E. McBean analyzed sources of uncertainty in modelling oxygen in the river. They concluded that while the DOSTOC model was correct in

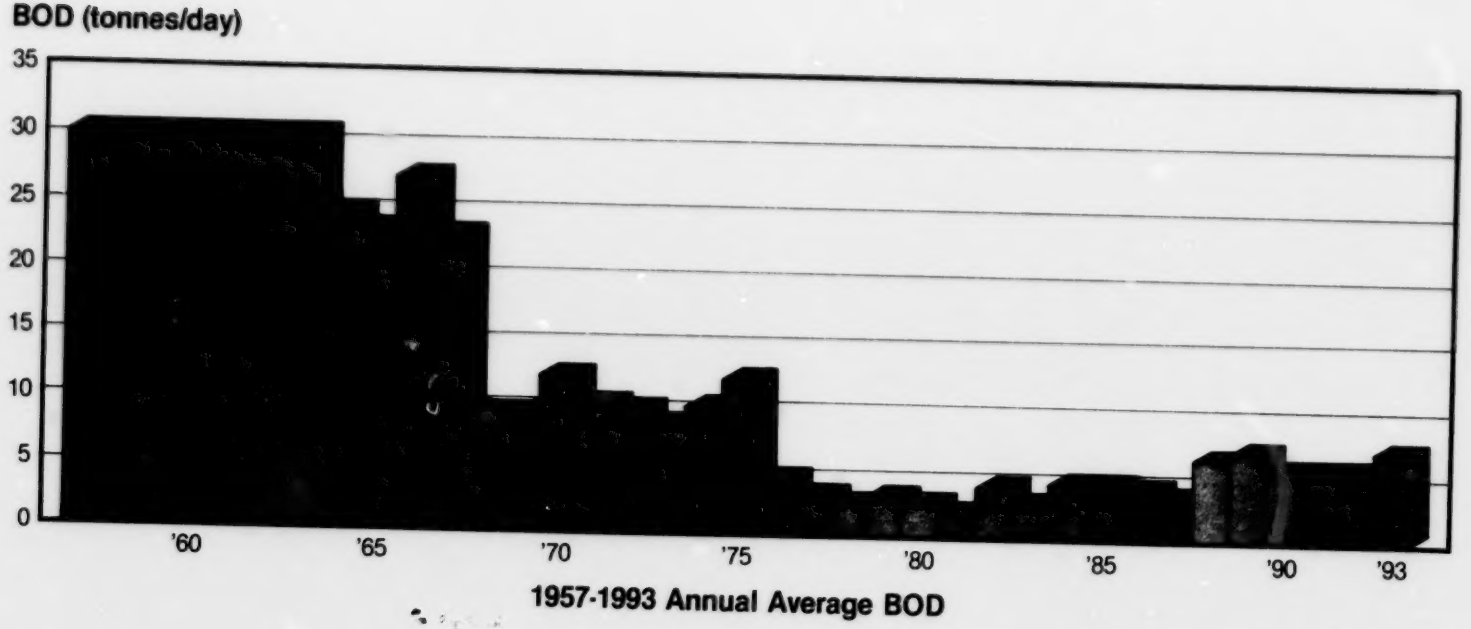


Figure 4-4

Mill Discharges of BOD to the Athabasca River

Modified from "Alberta Environment's Commitment" document Prosperity, Dec. 14, 1989

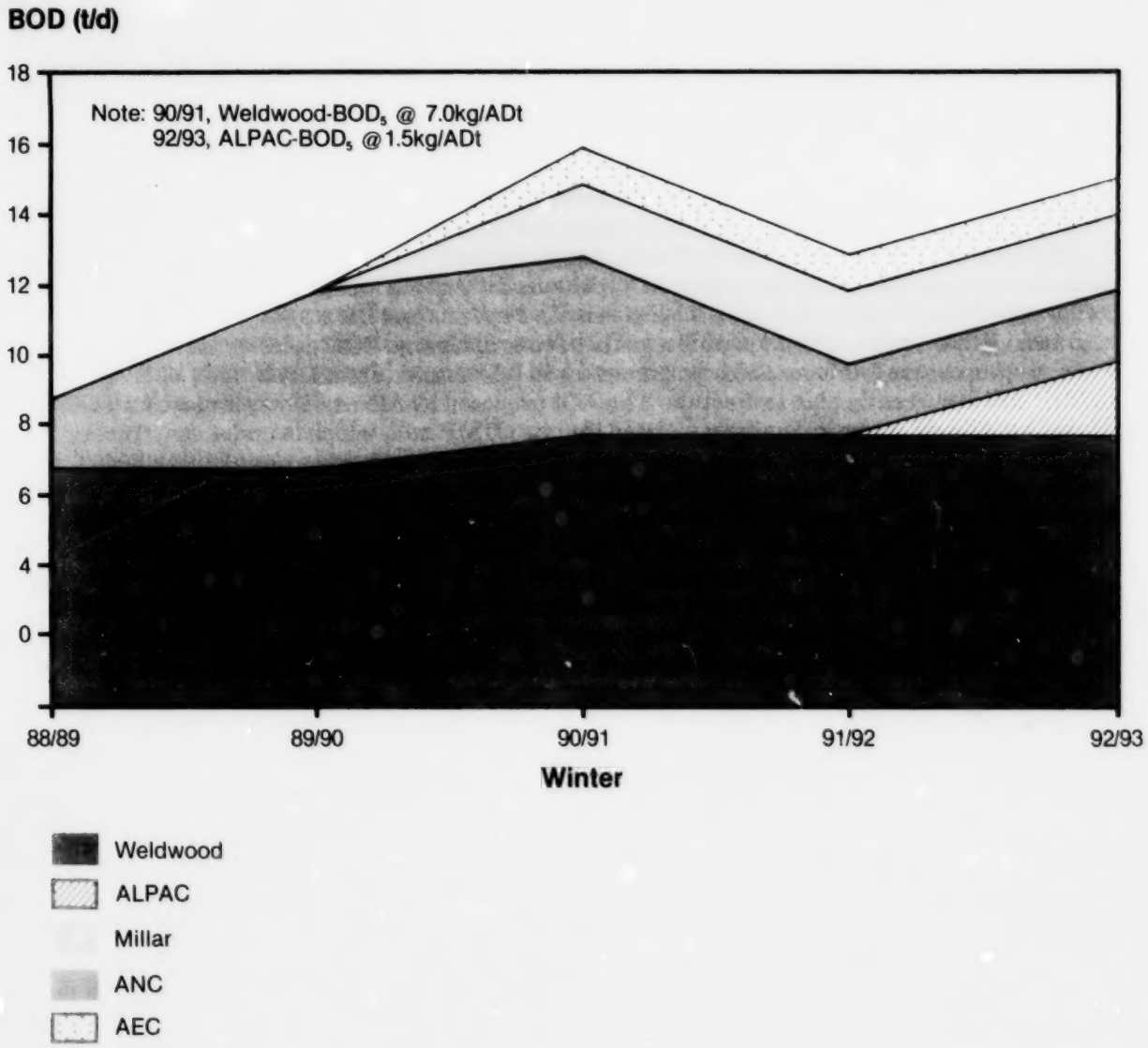


Figure 4-5

Projected Cumulative BOD_5 Discharge (t/d) to the Athabasca River

From document O-114, Athabasca River Management Action Plan

predicting that oxygen would be depleted to a degree that would highly stress water quality, *"The existing database for the Athabasca River, from which to make assessments, is far from adequate."* In particular, they cite sediment oxygen demand (SOD, the demand for oxygen by decay of organisms in sediments) as a critical measurement, a point agreed to by Alberta-Pacific.

The Review Board accepts Alberta Environment's model as being the most accurate, and has relied on Alberta Environment's model to prepare *Figure 4.3, Dissolved Oxygen Predicted at 7Q10 Flows*. It shows that if Alberta-Pacific met its stated BOD objective of 1.5 kg/ADt of pulp and all other mills discharged at 3 kg/ADt, the current ASWQO of 5.0 mg/L could barely be achieved. If the CWQG of 6.5 mg/L for less sensitive species and life stages were necessary to maintain fisheries in the river, all mills would have to discharge BOD at less than 1.5 kg/ADt. Neither proposal may be possible, for according to information from Dr. E. Hall of DOE, no CTMP mill is currently able to meet the 3 kg/ADt proposed by Alberta Environment for BOD. However, Alberta Energy Company insisted that its CTMP mill, which is under construction, would be able to discharge BOD at less than 3 kg/ADt. Also, a recent announcement of a proposed CTMP mill in Saskatchewan indicates that new technology may totally eliminate BOD discharges from such mills. The announcement was made after the deadline for submissions, and the Board received no presentation on the technology.

Both Alberta-Pacific and the Alberta Forest Products Association (AFPA) also propose to offset DO depletion from BOD by artificially aerating or injecting oxygen into the river. In particular, Alberta-Pacific's plan for liquid oxygen injection is proposed to totally nullify the mill's output of BOD, when necessary. While these developments are encouraging, only one pulp mill has tried this technology, and only for a very short period. In the case of the Athabasca River, any such compensatory system would have to be proven reliable to ensure that fisheries would be protected, for the detrimental effects of low oxygen on organisms would be very rapid.

The AFPA oxygen supplementation plan for all mills only proposes to meet the 5 mg/L ASWQO, and does not mention the more stringent CWQG or the possibility of revised ASWQO. It does not account for the possibility that fish requiring over 5 mg/L may exist in the river.

At the Grand Rapids on the Athabasca, approximately 200 km below the proposed Alberta-Pacific mill, there is sufficient reaeration, and low oxygen concentrations are not a problem below the Grand Rapids at current levels of industrial development.

It is also unlikely that oxygen problems occur on the Peace River due to current levels of development or planned pulp mills, because of the river's large size. However, Mr. Noton of Alberta Environment indicated that winter oxygen values on the Wapiti and Smoky Rivers below the mill violate the CWQG of 9.5 mg/L. Because the rivers are inhabited by mountain whitefish and two species of trout, some effects on fisheries may be occurring. Once again, there are no pre-mill records.

4.2.4 Conclusions and Recommendations

Due to the already high BOD loading to the Athabasca River, the Review Board is concerned that fish could be affected by current BOD inputs, and that fisheries could be jeopardized further if the load is increased. Recognizing its earlier recommendation that the Alberta-Pacific proposal not be allowed to proceed until further scientific work on the river is done, the Board recommends that work be expanded. It should include a thorough seasonal survey of fish species, life stages, food organisms, migration patterns and habitats in the Athabasca River. The proposed Alberta-Pacific mill should not be approved until it can be demonstrated that it (and the existing mills, since their effluent affects this project), can be accommodated while fully protecting aquatic biota from the effects of low oxygen. The survey, and any subsequent modelling, should be planned and implemented in a similar fashion to the studies proposed in Section 4.1.

Results of this survey should also be used for this or future projects by indicating what changes are necessary at other mills in order to protect fish and other organisms in the river. While reducing BOD inputs from existing mills is to be preferred as a means of accomplishing oxygen objectives, aeration and/or oxygen injection should be considered to protect waters of the Athabasca River. Because oxygen depletion can have catastrophic effects on organisms in a few days, any such system must be highly reliable.

Similar studies should probably be done on the Wapiti-Smoky system as it is possible that low oxygen is affecting the fishes and habitats of those rivers.

4.3 Other Pollutants

Several other chemicals in the effluents of pulp mills should be of concern on the Athabasca River, and perhaps downstream of mills elsewhere on the Mackenzie River system.

4.3.1 Fish Tainting and Water Taste, Odour and Colour

In winter, Alberta Environment records show that fish are tainted and water has an odour characteristic of pulp mill effluent as far downstream as Fort McMurray. In particular, phenolics, a category of organic molecules known to taint fish and cause taste and odour problems in water, are discharged to the Athabasca River from the pulp mills in Hinton and Whitecourt. Concentrations above Hinton are undetectable.

These discharges have rendered the Athabasca River non-compliant with both ASWQO and CWQG for phenolics and odours for up to half the length of the river under winter ice. These facts were of particular concern to residents of Fort McMurray and to Aboriginal Peoples who consume and market fish from the Athabasca River and Athabasca Delta. The long duration of ice cover on the Athabasca River exacerbates taste, odour and tainting problems by preventing the escape of volatile organic compounds, and by preventing oxygen exchange with the atmosphere. Methylation of some chlorinated phenols, which occurs under low oxygen conditions, can substantially increase taste and odour problems. Tainting is also known to

result from anisoles and veratroles, two classes of organic molecules resulting from the degradation of high molecular weight organic compounds such as chloroguaiacols and chlorophenols in pulp mill effluents. Some of these degradation products are more likely to cause taste and odour problems than their precursors.

Similar increases in phenolics are noted on the Wapiti and Smoky Rivers below the Procter and Gamble mill, and occasional taste and odour problems at the town of Peace River have been attributed to upstream pulp mills. Organic compounds discharged from the mills are also responsible for non-compliance of water colour with ASWQO and CWQG on the Wapiti and Smoky Rivers.

Due to greater dilution of the effluents, waters of the Peace River generally complied with ASWQO and CWQG.

Tannins and lignins, two other categories of organic compounds, are high below the existing mills, but there are no federal or Alberta regulations for them. Breakdown products are poorly known.

Most taste and odour causing compounds are only toxic to organisms at high concentrations, but they seriously impair the value of commercial, sport and subsistence fisheries and increase the cost of treating drinking water. While the Board heard that the extremely thorough treatment of effluents planned by Alberta-Pacific would minimize releases of chemicals causing taste, odour and tainting, the fates of specific compounds in the river were not convincingly addressed. While the Board does not consider such problems alone to be sufficient to deny the mill, they are serious enough to require additional study, at least as far downstream as the Slave River.

4.3.2 Eutrophication

Eutrophication, the over-enrichment of waters with nutrients, is also known to compromise water quality by causing excessive growth of algae and other plants. These algae and plants in turn are known to cause taste and odour problems, as well as to consume oxygen when they decompose. Eutrophication would therefore be likely to increase the incidence of fish tainting, water taste and odour problems, and to contribute to the occurrence of low oxygen under winter ice.

Alberta Environment's studies indicate that eutrophication is not a significant problem on the Athabasca River at present despite the fact that phosphorus, the nutrient which most commonly causes eutrophication, often exceeds Alberta's water quality guidelines. However, the Board received information indicating that all phosphorus in kraft mill effluent is usable by organisms. Even small increases in phosphorus discharged to the Thompson River in British Columbia caused a significant development of attached algae in the river below the mill.

Increases in urban populations and intensification of agriculture in the river basin would increase inputs of phosphorus to the river still more. The Review Board does not see nutrient loading as a serious problem at present, but background information on the current sources of nutrients and on the status of nutrient limitation in the river is necessary before management of eutrophication in the river can be properly planned. The forest industry's contribution to the

eutrophication problem could be controlled by requiring Alberta-Pacific and other mills to remove phosphorus from their effluent by tertiary treatment. The technology for this is well-developed and, if appropriate, it should be required of Alberta-Pacific if the mill proceeds, as well as to all other mills. This approach was suggested by Alberta-Pacific.

4.3.3 Toxic Trace Metals

High concentrations of zinc are discharged to the river by the mill at Hinton. While there appear to be no other high discharges of toxic metals, the effects of increasing inputs of organic material and the low oxygen condition of the river may cause increases in mercury and other metals that can be bacterially methylated. As in the case of chlorinated organics, methylated metals are bioconcentrated to a degree where undetectable concentrations in water can cause levels in fish that are too high for human consumption. It is noteworthy that high mercury values already have been recorded in fishes at some locations on the Athabasca.

The matter of toxic trace metals does not appear to be a serious environmental deficiency for the proposed Alberta-Pacific mill. However, study of the current status of mercury in fish, how it is affected by existing mills and low winter oxygen concentrations, and how additional inputs of organic materials from pulp mills and other sources are likely to affect the mercury cycle are recommended. In addition, discharge of toxic trace metals by all mills should be carefully monitored.

4.4 Environmental Effects of the Mill Effluent that Relate to Federal Government Responsibilities

The Terms of Reference of the Review Board include a consideration of the effects of the proposed mill on a number of matters of federal jurisdiction. The previously described concerns regarding chlorinated organic compounds in the river system, the possible lack of DO and fish tainting, relate directly to possible effects on fisheries. Similarly, if fish and wildlife are affected by these problems, this in turn could have negative impacts on Wood Buffalo National Park.

With respect to the water quality in the Northwest Territories, the Review Board received no information which would suggest that the actual quality of the water in the Northwest Territories would be sufficiently affected by the proposed mill or that it would be unacceptable for human consumption. However, the water quality could affect fish, as described previously, and therefore affect residents of the Northwest Territories that rely on the river system for their food.

As a result of the specific Terms of Reference that relate to federal jurisdiction, the Review Board recommends that the studies referred to in Section 4.1, 4.2 and 4.3 have particular regard for the matters dealt within this section. Representatives of the federal and of the Northwest Territories governments should be involved in the management of these studies.

5. Effects of Timber Harvesting on Indian Reserve Lands

5.1 Introduction

This section of the report presents the Review Board's examination of the potential environmental impacts on Indian Reserve Lands resulting from timber harvesting practices. In this review, the Board includes the potential effects on Indian (Aboriginal) People as well as their lands.

The terms of reference do not include the environmental effects of timber harvesting in the proposed FMA area, as this will be the subject of a separate process. At the same time, the Review Board is directed to examine the potential impacts of *"...timber harvesting practices as they may affect Indian Reserve Lands."* This unusual arrangement has made the Review Board's assignment difficult. This difficulty caused by separation of the FMA from the EIA on the proposed mill, and the resulting inability to use a total ecosystems approach in the assessment, are the key reasons why the Board recommends against such a separation in the future.

The exclusion of the FMA did not allow Alberta-Pacific to deal extensively with this matter in its EIA. However, because of the inclusion of Indian Reserve Lands in the Board's terms of reference and because of the paramount importance of the matter to the Aboriginal communities, many concerns relative to the FMA were raised and much detail was sought from Alberta-Pacific and the governments. The proponent was not fully able to respond to concerns, in part because its focus at the hearings was on the terms of reference, not on the environmental and social effects related to the timber harvesting operations. Also, Alberta Forestry, Lands and Wildlife did not address the environmental and social impacts of the timber harvesting at the hearings.

This leaves the Review Board in a position of having to assess how timber harvesting practices might affect certain lands, without a thorough understanding of what those practices will be. Also, a thorough public review and comment on the practices was not possible due to the restricted terms of reference. The Review Board therefore lacked sufficient information to completely deal with this matter, but, subject to that limitation, provides its views and recommendations.

At many of the hearings, concerns were expressed by the Aboriginal Elders and the local citizens of northern Alberta regarding the fragile ecosystems; the removal of hardwood, softwood, and mixed trees and other plant species; the effects of mechanical tree harvesting on the forests; the effects of timber harvesting on a wide variety of wildlife and their habitats—culminating in the overall impact on traditional land use, Aboriginal culture and the spiritual relationship of the Aboriginal People to the land. Some of the concerns went beyond the mandate of the Review Board. However, the Board is commenting on the land claims, the spiritual relationship between Aboriginal People and the forest, and hunting and trapping as it affects the Aboriginal People. These issues were fundamental to the positions of Aboriginal participants at the hearings.

The Board will then deal with physical and social effects on Aboriginal People and their lands, before concluding with recommendations on ways in which to deal with these matters by early Aboriginal involvement in the FMA process.

5.2 Land Claims

The Review Board heard numerous concerns regarding unresolved land claims of Indian peoples in or near the proposed FMA lands. Concerns were presented that land claims not be compromised by a business transaction like the FMA between the Provincial Government and a forestry company. Many Aboriginal land claims are on unoccupied Crown land areas, but if FMA areas are deemed by governments to be "occupied" or "third party interest" lands, then Aboriginal People fear that massive areas might be removed from claims.

The Board notes that land claims are not within its mandate. Some of the Board members believe that the above noted issues should be addressed by Aboriginal People and the governments before FMA negotiations are conducted, while others believe it would be appropriate to have land claims issues resolved before any kind of further industrial development takes place. However, all Review Board members agree that timber harvesting should not be allowed to have negative effects on matters such as land claim negotiations.

5.3 The Spiritual Relationship Between Aboriginal People and the Forest

The Elders of Aboriginal communities of northern Alberta and the Northwest Territories described the spiritual relationship between the Aboriginal People and the forest as a complex interdependence which forms the basis for Indian religion in the north. Elders and others spoke of how for thousands of years the cultural traditions, spiritual values and religious practices of the native people have ensured that the earth survives and thrives to this day. From the Great Spirit and native ancestors, they inherited a pristine land and, as a people, have safeguarded it for all future generations. Aboriginal Peoples' presentations stated that the land, water, air, forests, animals and humans are interdependent and all life forms should be respected and not abused. This view was very well stated by one of the Chiefs, Johnsen Sewepagaham of the Little Red River Tribe of Cree Indians, Chairman, Environmental Sub-Committee, Aboriginal Resources Development Group, during the Edmonton hearings:

> *"We raise our concerns because it is at the 'soul' of our existence. We originated and will remain on the lands which we live and use as aboriginal people. We are by tradition, culture and spiritual conviction 'Guardians' of the land and the creatures that roam the land as given to mankind by the Creator.*
>
> *This honest concern is not solely for our communities. It is for all of mankind. We thank the other Aboriginals and Canadians who have come before this panel to express their genuine concerns."*

Concerns were expressed that timber harvesting practices might not respect the spiritual relationship between Aboriginal People and the forest. Furthermore, such practices may interfere with native rights to use the forest for religious celebration. A great spiritual significance is placed on certain areas not situated on Reserve lands. Therefore the maintenance and protection of these areas are paramount to Aboriginal Peoples.

The Review Board recognizes that Aboriginal People have religious interests in the forests and that forests have spiritual significance to them. This fact should be recognized and respected by the proponent and the government. FMA negotiations should involve Aboriginal People, and should address the religious concerns of Aboriginal Peoples in a sensitive manner, especially as they relate to burial and other ceremonial sites.

5.4 Effects of Timber Harvesting on Indian Reserve Lands

5.4.1 By Removal of Tree Species

The Board heard presenters describe how the clear-cutting of the forest would create a "moonscape" and destroy not only a variety of trees but also rare plant species. It was mentioned a number of times that a tree farm is not a natural forest. Changes in the makeup of the area would adversely affect wildlife and their habitats and reduce the coniferous species. The resulting changes in these ecosystems would have a detrimental effect.

According to Alberta-Pacific, timber removal from an FMA area for use at Reserve sawmills is not controlled by the holder of the FMA. Off-Reserve softwood and mixed wood removal is administered through Alberta Forestry, Lands and Wildlife through conditions in the FMA. This is beyond the Board's mandate.

The Board recognizes that there will be negative effects on the wildlife and habitat from the timber harvesting, and that Aboriginal People should be consulted in order to minimize such impacts.

The Board suggests that Alberta Forestry, Lands and Wildlife, the proponent and the Aboriginal communities should negotiate a condition in the FMA which would provide for a "community forest", for the use and benefit of the Aboriginal communities within the FMA.

The Board also recommends that Indian Reserve boundaries be protected by meaningful buffers of virgin forests.

5.4.2 On Hunting, Trapping and Fishing

The Aboriginal People in northern Alberta are generally confined to small Reserves and communities. In order to maintain their economy, Aboriginal People hunt, trap, fish and gather on their traditional lands. The proposed FMA does not include the Indian Reserves, but will surround the many Reserves and communities within the proposed FMA area. It is the traditional use areas that cause the Aboriginal Peoples the greatest concern as expressed at the hearings. These traditional lands fall under the proposed FMA and, strictly speaking, are beyond the Board's terms of reference. However, the Aboriginal Peoples will be affected by operations on such lands, and the Review Board is offering comments on several of these.

The traditional subsistence economy is still a vital part of Aboriginal life in the north. Chief Walter Janvier of the Janvier Indian Band indicated this in his presentation to the Board:

> *"....Janvier always maintained a traditional lifestyle through our hunting and trapping....It's declined* [trapping], *but it's still being done in this area. Hunting is something that we value, and we always want to maintain. It's part of being Indian. Hunting means a lot to us as our life depends on animals around us, the wildlife. We want to make sure that is protected in the future. Hunting is something that makes us Indian and it is something that we feel strongly about....we don't want to lose our traditional way of living ...."*

Chief Pat Marcel of the Athabasca Chipewyan Band also emphasized this theme in his presentation to the Review Board:

> *"....Like most people in Fort Chipewyan, my people are very dependant on the water resources of the delta for travel, for drinking water, for fish, furs and other products.*
>
> *In terms of food: moose, fish, waterfowl and muskrat make up most of our diet...*
>
> *....the natural resource of the delta are an important source of income. Many of my Band members rely on trapping for all or a good portion of their annual cash income...."*

These selected comments capture the many presentations made to the Board by Aboriginal Elders, Chiefs and community members regarding the continued importance of living from the land.

Concern was expressed that timber-cutting and other industrial activities in the FMA area would scatter game and furbearing animals. It was suggested that clear-cutting of old forests would drive out caribou and other wildlife that the Aboriginal People rely on for food. Trappers could expect continued loss of animals and damage to their lines.

The Board recommends that the concerns of the Aboriginal People regarding their Treaty Rights to hunt, trap and fish on lands be properly addressed by the governments. Alberta-Pacific should be required to have detailed and well designed harvesting plans which have been developed jointly with the government, the proponent and Aboriginal representatives. Comprehensive native trappers' compensation should be developed and negotiated between the three parties and made part of the FMA.

5.4.3 On Reserve Wetlands

Expert opinion was presented to the Review Board on wetland regimes. On that basis, the Board has concluded that wetland forestry practices have to be a consideration for this specific FMA because Indian Reserve wetlands could be altered by harvesting on nearby FMA lands.

The Board suggests that significant and detailed studies of the water and wetland regimes and their alterations be part of the FMA review, and that the proponent be required to implement mitigative measures to control adverse effects.

5.4.4 Due to Exposure of Reserve Lands to Non-Native Interests

The Review Board listened to concerns related to forestry road patterns and connector highways which would provide access for harvested timber to be transported to the mill. These same roads would provide increased exposure of Reserve lands to non-native interests. Although non-natives cannot trap, hunt or fish on Reserves, the traditional lands surrounding Reserves are exposed to the competition for furs, game and other country food.

The Board recognizes that log hauls of timber to market, for mill or other users, results in road construction. The secondary effects of access for other users of the road system create a problem which cannot be readily resolved.

The Board suggests that consideration be given to restricting road access to the FMA areas to the Aboriginal People and the proponent's representatives. Such measures would reduce pressure on wildlife and the related subsistence economy. Negotiations between the government, the proponent and the affected Indian Bands should be used to develop a comprehensive road infrastructure plan. These actions will result in minimized disruption to the Aboriginal People and their traditional lifestyle by the mainstream society.

5.5 Socio-Economic Concerns— Jobs and Business Opportunities

A majority of northern Aboriginal People who made presentations stated that they were opposed to the proposed forestry project because their environment, informal economy and culture were at the greatest risk, and that there was little guarantee that they would benefit from jobs and business opportunities. Many indicated that they were not opposed to development, but were fearful of their future because of resource depletion around their Reserves with no share in the economic growth, either in the short or long-term.

Some Indian and Metis leaders from urban and more southern areas gave qualified support to the project. The support was based on expectations that the proposed project would meet all environmental standards and provide opportunity to escape welfare through access to training programs and employment.

Where support existed, concerns were expressed that job assurances and guarantees of meaningful participation were necessary from the proponent. Aboriginal People, whether opposed to or in support of the project, demanded an economic share of the forestry development, if it were to occur.

The possibility of establishing Reserve-located industry, such as saw mills, as well as forestry and mill job opportunities through equity employment programs, was cited by numerous presenters. Alberta-Pacific, while supportive of native overtures towards job opportunities, did little to commit the company regarding guaranteed participation in economic and employment opportunities.

The Review Board recognizes that Aboriginal Peoples could suffer substantial loss without any direct benefit from possible jobs or business opportunities. For this reason, it recommends that the proponent, both governments and the Aboriginal leadership immediately design training, employment, business development and financing programs specifically targeted for Aboriginal participation in the forest industry. These items should be included in the FMA negotiations and form part of the agreement.

Presentation to the Review Board at the Maria Munro Hall in Beaver Lake, Alberta.

5.6 Conclusions and Recommendations

Many of the preceding sections contain recommendations and suggestions that Aboriginal Peoples should be more extensively involved in developing the FMA because they are substantially affected. This is consistent with the views expressed at numerous hearings that Alberta Forestry, Lands and Wildlife has not adequately involved Aboriginal Peoples in its forest planning. Native peoples for centuries have occupied, used and been involved in the management of the forests and wildlife, yet this heritage does not appear to have been recognized, used or appreciated in forestry management.

In terms of the Alberta-Pacific proposal, the Review Board understands that a public review of the FMA will take place. This is considered essential, as the availability of a wood supply which can be harvested in an environmentally safe manner is essential before the proposed mill could be approved. The Board considers the role of directly affected Aboriginal People to be so important that they should be involved in preparation of the FMA—prior to its review with the broad public. The Review Board therefore recommends that because of effects of timber harvesting on Indian Reserve Lands, affected Indian Bands be given a substantial and formal status in FMA negotiations. It is also necessary to ensure there are financial resources available for the Aboriginal participation in the FMA negotiations, including expert, legal, management and related costs.

Some of the matters raised during the hearings which should have their input include:

- possible effects of the FMA on treaty rights;
- possible effects on Aboriginal Peoples' spiritual relationship with the forests;
- future needs of Reserve sawmill operations;
- appropriate buffers around Indian Reserve Lands;
- impacts on trapping, hunting, fishing, and gathering as well as compensation for affected trappers;
- possible effects on wetlands and plans for mitigation, where necessary;
- plans to minimize impacts on Indians and their lands as a result of logging roads and the related improved access;
- development of education, training, employment, business and financial programs; and
- impacts on wildlife and wildlife habitat, including endangered species and migratory birds.

6. Effects On the Area Surrounding the Proposed Mill Site

In this section of the report, the Review Board considers the potential environmental effects of the mill on a more localized basis than in the previous sections. In doing so, it has focused its attention on local citizens' concerns based primarily on two different geographical areas, both relatively close to the proposed mill site, depending on the particular effects being analyzed.

Certain effects would apply primarily to the area immediately surrounding the proposed mill site and within some five to 10 kilometres (about three to six miles) of it. For convenience, that area is referred to as the Immediately Affected Area. Other effects would be felt throughout a larger area, termed for convenience the Affected Region, which would extend to include the communities of Athabasca to the west, Boyle to the south, Lac La Biche to the east, and Calling Lake and Wandering River to the north. It is recognized that some impacts would extend further to an area which, for convenience, is simply referred to as Northern Alberta and the Northwest Territories.

6.1 Site Selection

The Review Board generally agrees with Alberta-Pacific that the Athabasca-Lac La Biche region shown in *Figure 6-1, Proposed Mill Site Location and Infrastructure*, would be the appropriate location for the proposed mill having regard for the location of the Athabasca River, the wood supply area, the economic state of the region, and the existing urban, transportation and utility infrastructure. Within the region, there are numerous possible alternative sites, nine of which were investigated by Alberta-Pacific. They are identified in *Figure 6-1*.

The site selection criteria involved a number of factors related to engineering and construction requirements, land use, environmental effects, proximity to urban and other infrastructure, and socio-economic impacts. Many of these factors would result in substantial cost differences for various sites, and this was a significant factor in Alberta-Pacific's selection of the proposed site. In addition to cost advantages over other investigated sites, Alberta-Pacific suggested that its proposed site was appropriately located to avoid a number of potential environmental impacts, and also to spread economic impacts over a number of communities in the Affected Region.

Some participants and local citizens questioned why the mill would not be located more centrally within the proposed timber harvesting area, generally further to the north and east and within one of the jurisdictions (Improvement District 17 or 18) where the timber harvesting and related disruptions would occur. Certain residents of the Immediately Affected Area criticized the site selection process used by Alberta-Pacific, particularly due to its lack of regard for socio-economic impacts on the Prosperity community and additional environmental costs that would result at the proposed site.

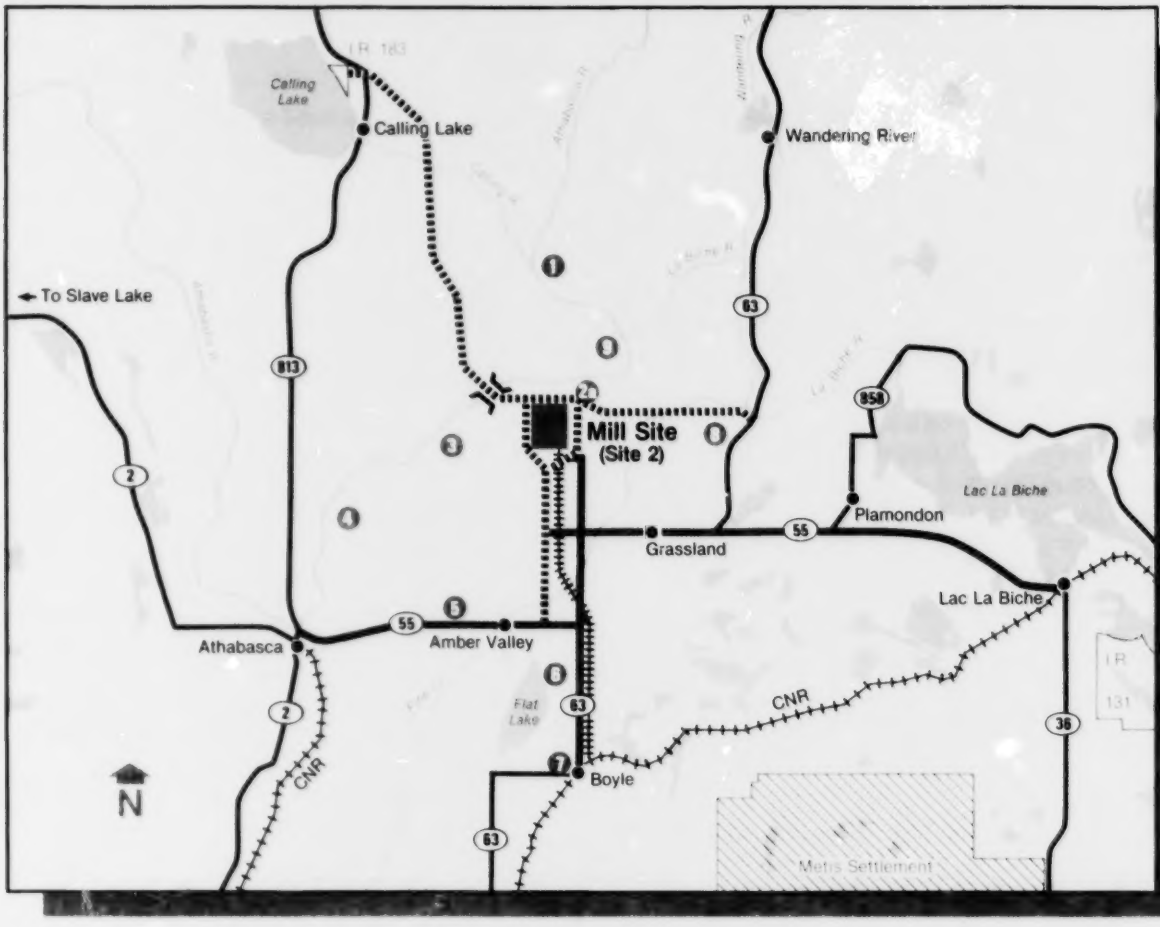


Figure 6-1

Proposed Mill Site Location and Infrastructure

The Review Board is satisfied, subject to certain detailed recommendations elsewhere in this report, and to the conditions attached to the County Development Agreement, that the proposed site would be an acceptable one. It also tried to address the question as to whether it is the optimum site. On the basis of the information received, the Review Board believes that the investigated sites west or south of the proposed site would not have significant overall advantages relative to the one proposed. It is also satisfied that a site further east, in the vicinity of investigated site 8, would not be preferred for a number of reasons, including considerable higher costs. The Review Board, however, cannot draw such conclusions respecting possible sites north or northeast of that proposed by Alberta-Pacific from the information presented.

There are two aspects of the proposed site, relative to sites somewhat to the northeast, which the Review Board believes may not have been adequately recognized by Alberta-Pacific's site selection process. Both aspects discussed below result because the proposed site and Immediately Affected Area are within a relatively well developed agricultural community. These problems could be avoided to some extent with a site modestly to the north, near site 2A, or near site 9 north of the Athabasca River.

The location of a large pulp mill within an established agricultural community would have a substantial social impact on the community. Indeed, the announcement of the proposed mill, related meetings and the hearings have seriously disrupted the Prosperity community. Even greater disruption might be expected if the mill proceeds. (This social impact is discussed further in Section 6.2 of this report.) The Review Board recognizes that it is difficult to quantify the equivalent cost of such social disruptions, but is concerned that the process used by Alberta-Pacific in selecting the site did not seriously make such an attempt.

Additionally, locating the mill within an established community, albeit a rural one, would likely create ongoing environmental problems such as noise and odour. These would affect neighbours of the mill and their productivity and lifestyles, and as a result add costs to the mill's operations for investigation and mitigation of such concerns. The Review Board does not believe that there was any specific recognition of these environmental impacts and related costs in the Alberta-Pacific site selection process.

The Review Board believes that, even though the proposed site is acceptable, efforts should be made to avoid a developed area, such as the Prosperity agricultural community. Such might be possible south of the Athabasca River, and certainly could be accomplished with a site north of the River. It is recognized that a site to the north would be more expensive, particularly if it were across the Athabasca River. However, increased costs would be at least partially offset by the social and environmental impacts mentioned previously, and the greater costs of mitigation which would be necessitated by the proximity to a significant number of residences. Also, although the cost differential between the proposed site and a more northern site, ignoring the previously mentioned environmental and social matters, is estimated by Alberta-Pacific to be substantial, it represents only a very small portion of the total cost of the project. Having in mind that the mill would operate for many years, the extra social and environmental problems of being located in a developed community could only be expected to increase.

The Review Board has recommended in Section 4 that approval of the mill not be given until further river studies are carried out. This would provide an opportunity for further investigation of the proposed site. It recommends that the proponent be required to carry out, in close consultation with communities in the Immediately Affected Area, a more detailed and site

specific investigation of the expected social and environmental impacts, and the related mitigative and other costs. This information should then be used in the site selection process through a detailed comparison of the proposed site with an alternative which would be in a less developed area, where people would be disrupted to a lesser extent. The proposed site should be approved if the detailed assessment confirms it to be an overall superior site, notwithstanding the greater social and environmental impacts on the Immediately Affected Area.

The further assessment of the proposed site relative to a more remote one should, in the first instance, be carried out by Alberta-Pacific. That assessment should then be reviewed by an independent group of consultants selected by and reporting to Alberta Environment. Both the initial assessment and the subsequent review by an independent group should involve discussions and allow input from any community that would be significantly and directly affected by the mill.

Conclusions and Recommendations

The Review Board believes the proposed site would be acceptable, but recommends that further study be made to see if a site to the north or east would be more desirable.

6.2 Social and Economic Effects during the Pre-Construction, Construction and Operating Phases

Most of the social impacts considered would occur within the Immediately Affected Area or Affected Region. The economic impacts would be within those same areas but would also extend over Northern Alberta and the Northwest Territories, and beyond. The anticipated socio-economic effects on Aboriginal communities of the proposed mill are included in this section, but the effects on Aboriginal communities of the timber harvesting operations are dealt with in Section 5.

Alberta-Pacific submitted primarily economic data dealing with the number of jobs which would result from the proposed mill, funds which would be expended during construction and operations, estimates of where those funds would be spent, and related spin-off effects. A significant number of participants, particularly those representing business interests such as Chambers of Commerce, accepted the data submitted by Alberta-Pacific and were supportive of the project, generally because of the expected economic growth and effect on the tax base.

Other participants disputed the estimates of Alberta-Pacific, raising questions such as: How many jobs would actually be available? Would they be full or part-time jobs? Who would get the jobs? Where would the expenditures be made? Would markets for bleached pulp continue in future? Why would there not be a paper mill from the outset of operations? These participants also emphasized that considerable government expenditure would be required to initiate the project, and there would be offsetting social costs.

A number of participants were concerned about developing a specific plan for development of the area, including all potential resources of the area rather than just the cutting of forests.

Several presentations claimed that tourism could generate the same, or greater, economic benefits as pulp and paper development, but no documented evidence was presented to support these claims.

The issue of direct and localized effects on Aboriginal People by the mill itself was not the focal point for most presentations by individuals or groups from the Aboriginal communities. Most Aboriginal presentations were opposed to the project, despite the possibility of jobs, primarily because of concerns respecting the timber harvesting operations and the effects of mill effluents on the river system. Some urban Indian and Metis leaders were supportive of the project because of the opportunities for jobs, including those at the mill.

There were also concerns expressed regarding the potential social impacts of further industrial development on the Aboriginal People of the North. Some of these references were directed towards all industrial developments, rather than just the Alberta-Pacific proposal. There were many references to the social problems and high rates of unemployment that Aboriginal People experience in regions where industrial development is occurring.

Social Effects

Most of the social impacts prior to construction would be relatively minor in nature. There has already been a disruption to the Prosperity agricultural community and some effect on land prices. From the information received, the Review Board concludes that part of the disruption to the community resulted from the land acquisition practices of Alberta-Pacific, particularly from its policy of using a land agent rather than dealing directly with landowners.

During the construction phase, social impacts would become more significant. Workers would be housed in a camp near the mill site. There would undoubtedly be problems with intrusion of transient workers into community affairs, traffic, garbage disposal, noise, and additional crowding in recreational and other areas. There is also a danger of increased crime rates as a result of transients that might be attracted by a perceived boom climate in the region, even though they may not be workers on the project. It is also likely that the region would experience inflation in land prices and living costs.

During operations, many of the social effects would continue, but at a lesser level. Clearly, there would be more people living and working in the area and the lifestyles of those now residing there would be affected. An increase in the size of regional communities, possible crowding at schools or hospitals, and probably increased prices for land and homes would be among the effects.

The potential exists for significant negative social impacts on Aboriginal People within the Affected Region. These would include inflation in living costs, and other stresses that often accompany a sudden high level of industrial activity. Special effort would be required from Aboriginal leaders, with the assistance of governments and Alberta-Pacific, to try to control these effects.

Although there would clearly be social effects in the Immediately Affected Area as well as the Affected Region and beyond, and although these effects would result in personal and dollar costs, it would be difficult to quantify them and few of the participants attempted to do so.

Economic Effects

Aside from some inflation in land prices, there would not be major economic effects during the pre-construction phase. Economic effects would increase immediately prior to construction and reach their peak during that phase. There would be ongoing economic effects during operations.

Some of the economic effects would likely be negative. For example, increased pollution, or perception of pollution, could reduce tourism in the area. On the other hand, a higher population in the area might offset any reduction that would otherwise occur. There could be negative economic effects on fishing and trapping, or on independent saw mills, but these would relate primarily to the timber harvesting operations which are beyond the mandate of the Review Board. (The effects of these operations on Aboriginal communities are dealt with in Section 5.)

Significant costs for government infrastructure would be required, including roads and bridges. These could vary considerably depending on the site. Similarly schools, hospitals and other municipal facilities would have to be provided.

Positive economic impacts would clearly include a large number of jobs created by the project. The exact number of direct and indirect jobs was debated, but the Review Board is satisfied there would be an increase in employment in the Affected Region. However, it is not certain whether jobs would go primarily to local residents, and whether any significant number would go to Aboriginal People. The vast majority of those who would work at the mill over the long-term would be Albertans, whether or not they are now Albertans.

There would also be major expenditures for goods and services related to the construction of the mill and ongoing operations. It is difficult to estimate the exact amount or where those expenditures would be made, but some would clearly be in the Affected Region. Undoubtedly, many of the expenditures would be over a broader area, probably centred in Edmonton.

The tax base for local governments would increase and the mill would generally provide economic growth to the area. This would be enhanced further, if and when a paper mill were added to the project. Alberta-Pacific suggested this could be by the mid-90s.

Conclusions and Recommendations

The proposed pulp mill, like all mega-projects, would provide many economic benefits, not only to the Affected Region, but to the province as a whole. The Review Board agrees with a number of the participants that the general region in which the mill would be located is in need of economic stimulus. At the same time, it must be recognized that there would be related costs if the mill goes ahead. It is therefore important to take measures to ensure that those who would face the social and other costs would derive an appropriate share of the economic benefits which would result.

Some of the economic benefits and some of the costs were estimated by Alberta-Pacific or other participants. However, there was no cost-benefit analysis submitted to the Review Board, and the information received is insufficient to allow preparation of an overall cost-benefit study.

Any such study would have to include the timber harvesting operations which are beyond the mandate of the Board.

The Review Board assumes that the Alberta Government prepared an overall cost-benefit study and considered alternative patterns of economic development prior to initiating projects such as proposed by Alberta-Pacific. The comments made by citizens at the hearings convince the Review Board that the Alberta Government should make special efforts in future to ensure that there is greater public involvement in cost-benefit and planning studies. Such studies should look at long-range economic development, including alternative uses of resources. (Section 8 recommends that, in future, review panels should be empowered to investigate and report on these matters.)

In this case, the Review Board accepts that there would be a favourable economic impact on the Affected Region and the province as a whole. Most of the social costs could be reasonably accommodated or mitigated to some extent. To illustrate, many local governments indicated at the hearings that much of the municipal infrastructure, such as schools and hospitals, is already in place. In terms of mitigation of social costs, the application of certain measures will help, although it is recognized that the costs will not be totally eliminated.

Assuming that the government concludes that a pulp mill and related forest development will result in overall net benefits to the province, and that such developments fit plans for the northern forested area, the Review Board has several recommendations to offer. It believes they will tend to minimize costs maximize benefits, and ensure that those experiencing the costs, receive some of the benefits. The recommendations are as follows:

- Alberta-Pacific should be required, to the extent legally possible, to hire local residents, including Aboriginal People. (The matter of Aboriginal employment in forest operations is dealt with in Section 5.)

- Appropriate training should be available for local residents, with emphasis on Aboriginal People, in a timely manner to increase their chances of obtaining available jobs.

- Alberta-Pacific should be required to emphasize businesses in the Affected Region in obtaining necessary supplies and services.

- Alberta-Pacific should be required to generally maximize spending in Alberta and the remainder of Canada.

- There should be strict rules at the construction camp to minimize social impacts on the Immediately Affected Area, and they must be enforced.

- Policies and plans should be developed that would minimize traffic impacts on residents in the area, whether related to transport of workers or hauling of wood to the mill.

- Alberta-Pacific should use fair and reasonable land acquisition practices, and should endeavour to deal directly with landowners so as to avoid misunderstandings.

- There should be community involvement in plans and policies that relate to social and economic impacts, such as the construction camp rules and traffic impacts mentioned earlier. A liaison committee which would be made up of residents, including Aboriginal

People and other representatives from the Immediately Affected Area and the Affected Region, should be formed. The committee should be sanctioned and sponsored by the Alberta Minister of Environment, and include representation from that department. It should have the responsibility to advise government regulators on the variety of matters it deals with, and, in that manner, have meaningful input to planning and operations. (This same committee should be involved in certain environmental matters dealt with in subsequent parts of this section.)

- There should be co-ordination among local and other governments to ensure the most efficient process in making homes, hospitals, schools and other infrastructure available, and there should be assistance to and sharing of government revenue among municipal governments, if necessary.

6.3 Effects of Emissions to the Atmosphere

The principal concerns of local citizens and others respecting emissions to the atmosphere relate to sulphur and chlorine compounds, oxides of nitrogen, water emissions and particulates which might cause fog, and odours, whatever their source. With respect to particulates, the Review Board is satisfied that the use of electrostatic precipitators and other control equipment should meet all relevant provincial and federal standards. There is little reason to expect the mill operations to add significantly to fog problems.

Only small amounts of chlorine compounds would be emitted and care must be taken that the temperatures at which sludge is burned are high enough to safeguard against release of dioxins. The Review Board believes this could be accomplished, but the plans must be carefully reviewed by Alberta Environment and monitoring and inspections must be effective. Also, the release of oxides of nitrogen should not result in serious localized environmental problems, although it will add slightly to an environmental problem for the province and country as a whole. As is the case with all emissions to the atmosphere, careful on-site and off-site monitoring and enforcement would be required to ensure that standards and approval conditions are being met. The monitoring must be carried out in an effective manner in accordance with detailed direction from Alberta Environment and the results must be communicated to the liaison committee and interested persons as soon as available.

Some 15 tonnes of sulphur dioxide would be emitted each day. This would result in increased wet and dry sulphur deposition within and beyond the Immediately Affected Area. Sulphur emission and deposition standards are well established, and the technology for safe release and accurate monitoring are well understood. The this design of the facilities would have to be based on site-specific meteorological data which has not yet been obtained. If this design requirement were met, the Review Board would not expect serious and unsolvable problems regarding sulphur emissions. However, if the mill is to be located in a developed agricultural community, as proposed, additional ambient and soil monitoring is required. If the mill proceeds at the proposed location, or at any other location where substantial sulphur deposition would take place on agricultural lands, the Review Board recommends that an initial soil survey be carried out prior to the commencement of operations. This would provide background data which would allow survey data to be subsequently collected during operations and be used to determine if negative impacts were resulting from the mill operations.

The Review Board believes that if emission standards are strictly enforced, the most significant atmospheric problem may well be fugitive sulphurous odours of the variety long associated with pulp mills. The Review Board accepts that the proposed mill would involve modern technology and operating procedures which would cause fewer odour problems than would be expected with older mills. However, the Review Board questions whether odours would be limited to within 1,600 metres (one mile) of the plant, as suggested by Alberta-Pacific, particularly when plant upsets occur.

If the mill were to proceed in the Prosperity agricultural community as proposed, ongoing odour complaints could be a significant problem. The Review Board recommends that any approval issued for a plant in a developed community with nearby residents should require the best technology to be utilized to avoid emission-related odours, and also that a formalized complaints investigation process should be established. When complaints are received, they must be investigated promptly and corrective action must be taken. The mill operator should understand that legitimate complaints must be remedied at any cost, even if it means the reduction of mill operating levels. The Review Board recognizes that such stringent conditions could be very difficult for an applicant to accept. However, it believes that future pulp mills must be located such that the odours which accompany their operations will not disrupt the way of life for a significant number of residents.

Conclusions and Recommendations

The Review Board finds the proposed mill acceptable in terms of effects of emissions to the atmosphere. However, appropriate monitoring of air and soil is needed, including the gathering of base-line data prior to operations.

If the mill is to be located in a developed community, very special effort is needed to minimize odour-causing releases, and to investigate odour complaints. The liaison committee recommended in Section 6.2 should play a role in the complaints investigation process.

6.4 Local Ground and Surface Water

Section 4 of the report deals with potential effects on river water as a result of effluent from the proposed mill. This section deals only with possible effects on ground and surface water in the Immediately Affected Area due to the mill operations. Surface and ground water are used by residents for household needs and for agricultural uses such as watering livestock.

Surface Water

Concerns were expressed that the quality of surface water not be affected by spills either within or outside of the plant site, with particular reference to the water courses locally known as Bear and Deer Creeks. The concerns related both to possible contamination of the surface water with chemical pollutants or other run-off from the mill site, and to the volumes of water which would be available.

The Review Board is generally satisfied that the surface run-off containment system proposed by Alberta-Pacific would be effective. It also believes that the containment plans for effluent being treated and on-site spills would be adequate. It would be particularly important that the soil cementing approach planned by Alberta-Pacific is effective and ensures that no leakage of on-site liquids would occur to affect off-site water. It is also important that emergency response measures would adequately handle not only the site-related problems if the treatment and containment systems did not work, but also accidental off-site spills which might involve chemicals or other materials being moved into or out of the mill.

All of the proposed measures to contain surface run-off and accidental spills on-site are essential to protect water quality of the creeks. It is important that they be monitored regularly, not only for quality, but also for the quantities of water available. The monitoring proposal by Alberta-Pacific in this regard appears adequate.

Ground Water

Local citizens in the Immediately Affected Area expressed concerns that ground water might become contaminated and also that the water table in the area might be lowered due to construction or other operations at the mill site.

Again, the principal line of defence against polluting ground water will be efforts to ensure that mill site run-off, spills, and fluids that are within the treatment system are adequately contained and do not leak into the area surrounding the site. Alberta-Pacific's planned containment system, soil cementing, and lining of effluent lagoons should minimize any potential impacts.

Although negative effects are not anticipated, careful monitoring and management will be required to ensure that effects are not taking place.

Conclusions and Recommendations

The Review Board is satisfied that Alberta-Pacific's plans for the containment of effluent being treated, spills and run-off from the mill site should properly protect the quality and quantity of ground and surface water. To ensure that this is the case, the following recommendations should be implemented if the mill proceeds:

- The design of spill and run-off containment systems should be carefully reviewed by Alberta Environment prior to final approval.

- The effectiveness of the system should be reviewed by on-site inspection by Alberta Environment after construction is complete.

- Emergency plans should be put in place to respond to and minimize impacts of any unexpected deficiency in the containment system, or any major spill.

- A careful survey of surface water quality and quantity should be made prior to any construction to provide base-line data.

- Water wells in the area should be surveyed prior to construction to provide base-line data respecting water quality and water table levels.

- Ongoing monitoring of surface and ground water should be carried out during construction and operations, and appropriate response to problems must be developed, to be taken if necessary.

- All monitoring should be carried out in accordance with direction from Alberta Environment, in consultation with the local liaison committee, and the results must be made available to residents in the area.

- If significant negative impact occurs to water in the area, either in terms of quality or quantity, Alberta-Pacific must provide alternative sources of water to affected landowners at no cost to them.

6.5 Solid Waste Disposal

If the project proceeds, there would be large volumes of solid waste which must be properly disposed of both during construction and operation phases. During construction, the construction debris would be disposed of on-site and other wastes would be disposed of to remote landfill sites, in accordance with direction from Alberta Environment.

During operations, solid wastes would be primarily sludge from the clarifier, ash from the power boiler, rejects from the filtering, screening, and cleaning facilities, general wood-yard waste, contaminated pulp, and waste treatment chemicals. The wood waste and sludge from the primary clarifier would be incinerated in the power boiler and the resulting potential air contamination is referred to in Section 6.3. Hazardous chemicals would be sent to specialized treatment facilities. The remainder of the solid wastes would be taken to a landfill which is planned to be on-site but, depending on the suitability of the location, could be elsewhere.

Concerns were raised by a number of participants in the hearings, particularly those in the Immediately Affected Area, regarding the large volume of solid wastes and the possible effects on ground and surface water, or the possibility of odours. If large volumes of waste were to be moved off-site, concerns were also expressed regarding the increased volume of traffic, and the possibility of accidents which would release hazardous wastes. The latter concern was also raised regarding miscellaneous toxic wastes, such as chemicals, which would be trucked elsewhere for specialized disposal.

Conclusions and Recommendations

The Review Board is satisfied that solid wastes would not present a serious environmental problem, provided that the most stringent requirements of Alberta Environment are rigidly enforced. The solid wastes from the operations must be inventoried on a continuous basis, and those which are too hazardous for landfill must be collected and safely transported and disposed of. The principal landfill, whether it is at the mill site or elsewhere, must be chosen

and designed very carefully. The disposal must ensure that there will be no contamination of water or soil adjacent to the landfill site, and no odours.

Appropriate wells and other monitoring devices must be provided to ensure control of contamination at the landfill site. The monitoring program must ensure that any related escape of contaminants would be identified very early, and corrective action taken. A new landfill site should be developed if necessary. As with all monitoring, residents in the area of the landfill must be aware of the monitoring program and of the results on an ongoing and timely basis. The local liaison committee should play a role in that respect.

Emergency plans must also be in place to deal with any spill of highly toxic materials, whether on-site or in transit to or from the mill site.

6.6 Effects of Roads and Railways

If the mill proceeds, roads and railways in the area would have to be modified, upgraded, and supplemented to move workers, equipment and wood resources to the mill, and the produced pulp to markets. (The major changes are shown in *Figure 6-1, Proposed Mill Site Location and Infrastructure.*) There are separate approval processes for these transportation facilities. For example, the National Transportation Agency (NTA) would be responsible for approval of the additional railway spur from Boyle to the mill site. Notwithstanding these separate approval processes, considerable discussion of roads and railways took place at the hearings and many concerns were raised, particularly by residents in the Immediately Affected Area.

The Review Board considered these concerns and, in this section of the report, gives its views respecting the roads and railways related to the proposed mill.

Roads

Some of the concerns raised included closure of existing roads either for road construction purposes or permanently once the mill is in operation, securing of right-of-way from landowners, public safety on busy roads and school bus routes, road noise due to traffic, and related dust. Concerns were also raised that access to wilderness areas would be increased, facilitating poaching and having a negative effect on wildlife. There was also discussion of the costs that would be involved to build and upgrade roads, maintain them, and to build the necessary bridges across the Athabasca River.

The Review Board recognizes that there would be some major changes in roads and traffic patterns in the Affected Region and beyond. Overall, it is satisfied that there would be better roads in the general area that would provide better access for outsiders to the area, as well as for people of the region to travel from their homes to towns or elsewhere. There would also be better access to remote areas for hunting and recreation, which would have a negative impact if not closely regulated.

At the hearings, Alberta Transportation described its process for selecting the routing for new roads. It also summarized its plans for building and modifying roads in the area. The process

described by Alberta Transportation included public involvement, but it involved citizens' response to already developed plans. Alberta Transportation generally took the position that it would select the new routes and changes to be made, inform the public, and hear the reaction. Most of the actual input to decisions was through local governments.

The Review Board believes that Alberta Transportation should communicate more with local people to optimize the utility of the road network to residents of the area. Also, through increased meetings, construction schedules and methods could be designed so as to have minimum negative impacts on the public. Efforts should also be made to minimize alterations to natural drainage patterns.

Once the new roads are in place, they must be well maintained. Dust must be minimized, without using hazardous chemicals. The roads should also be well posted and patrolled through developed areas to minimize danger to the public. Traffic patterns should be chosen so that heavy loads and equipment would be routed through areas where minimum residential traffic is expected.

The provincial government should also ensure that improved access to remote forest areas does not increase poaching or overhunting or overfishing, thus depleting the stocks of wildlife and competing with Aboriginal People for food.

Railways

A spur railway line would be required from Boyle to the mill in order to move pulp to markets and chemicals and other supplies to the mill site. Jurisdiction for the railway would be federal, and the approval process would involve the NTA. Representatives of CN described their plans in general, and indicated that they would be dealing with the NTA to seek approval for the proposed railway spur. In dealing with potential negative environmental impacts, CN indicated that it would follow the EARP Guidelines Order set out in the environmental assessment and review process of the federal government.

Many residents of the Immediately Affected Area and the Affected Region raised concerns regarding the plans for the railway spur. These included the method of securing the right-of-way from landowners, the safety of crossings, the noise and vibration from frequent trains, use of toxic spray along the railway right-of-way, site clearing, drainage of intervening water courses, stream crossings, and effects on forests and wetlands caused by alteration of drainage patterns.

The railway spur is essential if the mill proceeds and, in the judgement of the Review Board, would not have an overall serious negative impact on either the Immediately Affected Area or the Affected Region. There would be potential benefits to economic growth by the extended railway line. There is some potential for negative impact, particularly for people and ecosystems in the corridor that would be selected for the rail line. Also, care should be taken to minimize the time period during which tank cars containing hazardous materials would be sitting in populated areas, such as Boyle.

In an effort to minimize negative impacts, the Review Board recommends that CN conduct a public involvement program fully in keeping with the EARP Guidelines Order.

Conclusions and Recommendations

The proposed roads and railways needed to serve the mill would have certain beneficial impacts, but also adverse effects on some individuals and ecosystems. However, the route selection and design can be carried out in a manner that will minimize these impacts. In order to do this, an effective public information program is needed.

The Review Board recommends that both Alberta Transportation and CN do further work in the area. This should involve meetings to hear from affected residents, and then further planning to incorporate public views.

6.7 Visual Effects and Noise from the Mill

Visual Effects

A mill such as proposed by Alberta-Pacific would necessarily be a large, imposing structure. The more remote the mill, the less it would detract from aesthetics of the area.

The Review Board does not believe the appearance of the mill would be seriously objectionable. However, if the mill is built where proposed by Alberta-Pacific, every effort should be made to design the mill, paint the equipment and buildings, use the buffer space, plant trees and do other landscaping in a manner which would reduce the unattractiveness as much as possible.

Noise

A large industrial mill would create some noise, as would the traffic to and from it. Indeed, the noise and other hazards related to heavy traffic were of greater concern to residents of the Immediately Affected Area than noise from the mill itself.

Mufflers and other special measures should be employed to minimize the noise impacts of any mill. A buffer zone to increase the distance from nearby residents is needed if the mill proceeds in an existing agricultural community. Noise complaints must be responded to in a timely manner, and corrective action taken.

Noise from trucks and other motor vehicles is likely to be more significant. If the mill proceeds, the proponent should be required to work with all affected communities, residents and government departments to put in place transportation routings which would minimize traffic impacts. Additionally, rules should be imposed regarding the speed of vehicles, the use of jake-brakes, and other noisy or dangerous practices on roads or highways near communities or residences. This should be done by the mill owner, through contracting practices, even though the truckers are not expected to be direct employees.

Conclusions and Recommendations

The Review Board does not believe that visual impact or noise are reasons why the proposed mill could not proceed in an environmentally acceptable manner. However, it is important to minimize such impacts through site planning and landscaping at the mill, and the application of reasonable rules to mill-related traffic. The local liaison committee should be involved in these matters.

6.8 Effects of Water Pipelines

Three water pipelines are proposed between the Athabasca River and the mill site, as shown on *Figure 6-2, Proposed Mill Site and Water Pipelines*. Two of the lines would take water to the mill and the third would discharge effluent to the river. The intake lines would be buried parallel to the existing Nova gas pipeline. Warm water would flow in one of the lines to ensure that operations are feasible even in cold, winter weather. Both of the intake lines would go through the Pine Sands Natural Area.

The effluent pipeline (Alternative I) would be south and east of the Pine Sands Natural Area and would release water to the river at the point shown in *Figure 6.2*.

The proposed water pipelines were not a focus of concern at the hearings. The Review Board believes they could be installed without serious impacts. Care should be taken in acquiring the right-of-way to use reasonable and fair procedures in terms of landowner contacts. The trenching and burying operations must be carefully carried out and reclamation must meet current conditions.

With respect to the intake lines, the road access to the pumphouse appears unnecessarily wide. Recognizing that it is within the Pine Sands Natural Area, the road width should be reconsidered.

Alberta-Pacific put forward two alternatives to the route proposed for the effluent line. They are shown in *Figure 6-2*. If an alternative is required, either would be acceptable to the Board.

Conclusions and Recommendations

The Review Board concludes that water pipelines between the Athabasca River and the proposed mill would not cause serious environmental problems. Care must be taken in their installation and operation and in the reclamation of the pipeline rights-of-way.

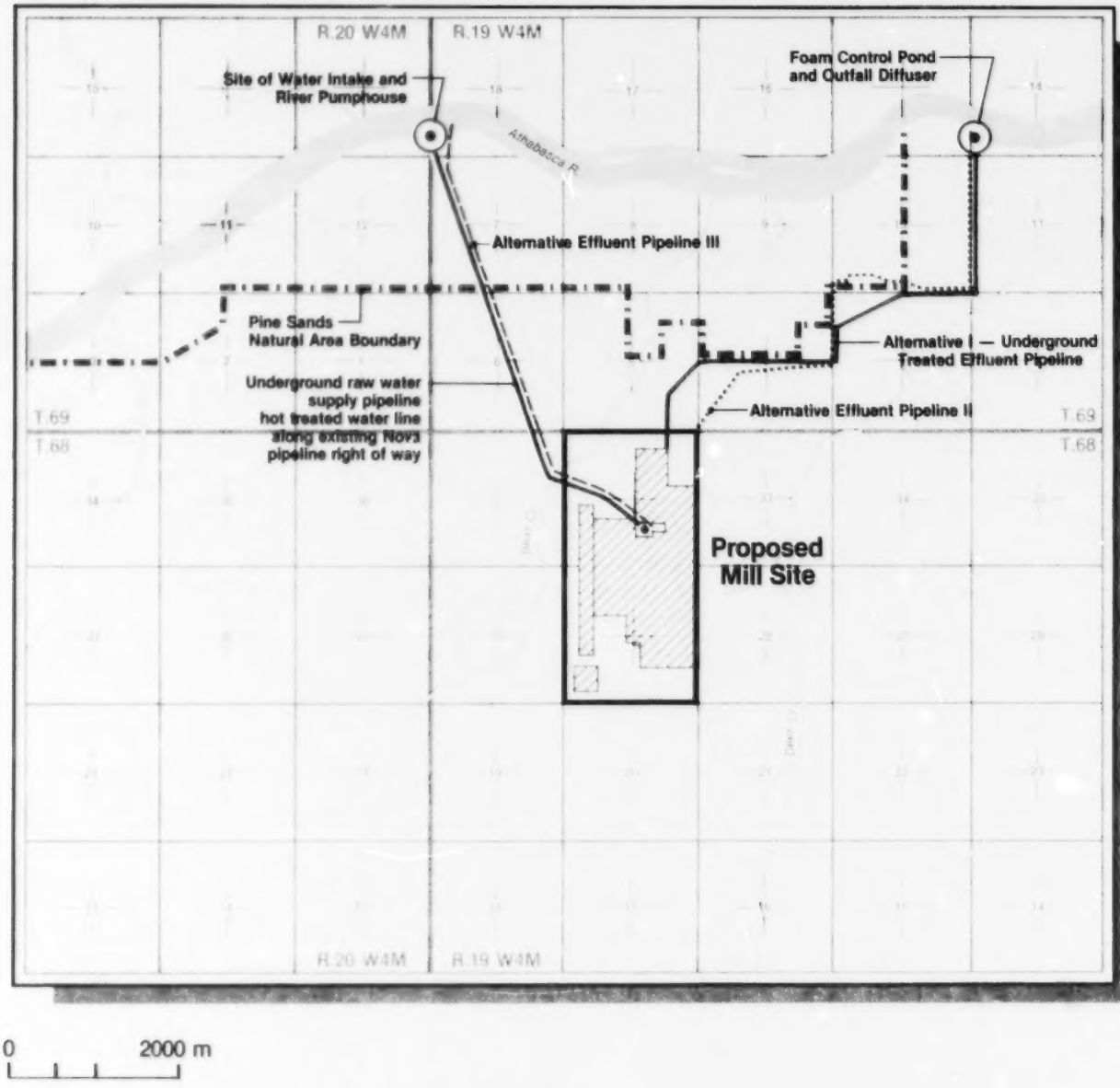

R.20 W4M
R.19 W4M
Site of Water Intake and River Pumphouse
Foam Control Pond and Outfall Diffuser
Athabasca R.
Alternative Effluent Pipeline III
Pine Sands Natural Area Boundary
Alternative I — Underground Treated Effluent Pipeline
Underground raw water supply pipeline hot treated water line along existing Nova pipeline right of way
Alternative Effluent Pipeline II
T.69
T.68
Proposed Mill Site
0
2000 m

Figure 6-2

Proposed Mill Site and Water Pipelines

6.9 Effects on the Pine Sands Natural Area

There is a natural area immediately north of the proposed mill site as shown on *Figure 6-2*. This area, known as the Pine Sands Natural Area, is used for recreation by many residents of the Immediately Affected Area and beyond. It is a source of considerable pride to the community and reflects ongoing efforts to maintain the area in as close to its native state as is reasonably possible. Concern was raised at a number of the hearings that the area could be negatively affected either by pipeline or road construction through it, or through irresponsible use by new workers or other transients in the area.

The Review Board agrees that the Pine Sands Natural Area is special and must be protected for the enjoyment of current and future generations. It is satisfied that the water pipelines and pumphouse can be constructed through the area with acceptable impacts, as commented on in Section 6.8. However, extreme care must be taken in construction and reclamation.

Similarly, the new road to be built will affect the area, and care must be taken to minimize and localize that impact. Of greater concern to the Review Board is that newcomers to the area might not appreciate the significance of the Pine Sands Natural Area, and may mistreat it. This will require an effort on the part of Alberta-Pacific and other construction contractors in the area to make sure their workers understand the importance of the Pine Sands Natural Area, and treat it accordingly. They should work with residents of the area, through the local liaison committee, in this respect.

The question of a landfill adjacent to the Pine Sands Natural Area was raised at one of the hearings. The Review Board has been informed that measures to clean up the site are being evaluated by the local Board of Health and the County of Athabasca #12.

Conclusions and Recommendations

The Review Board believes that the Pine Sands Natural Area requires special effort on the part of Alberta-Pacific and others doing construction to minimize environmental damage. Additionally, the local liaison committee should be involved in ensuring that rules exist regarding use of the recreation area, and that they are enforced.

6.10 Responses to Emergencies

A major industrial operation can be expected to have emergencies. Many participants expressed concerns regarding such possibilities and questioned whether the response would be adequate. Concerns included the availability of medical and first aid assistance on-site, methods and timeliness for notification and evacuation in the event of gaseous releases, the time lag to get trained crews to the site of an emergency, and who would pay for costs of such emergencies. There was also discussion about the possibility of untreated effluent getting into the river, and what the results would be.

Spills

Alberta-Pacific's spill-control system includes complex control and metering of the effluent treatment system. A spill pond would safeguard against any upset that could not be contained within the system. Provided that the control system for spills is carefully designed and constructed, and that all operating personnel are fully familiar with it, uncontrolled spills of effluent to the river or to surface or ground water should not occur.

Releases to the Atmosphere

Gaseous emissions from the proposed mill have the potential to be serious, but should not cause major emergencies. Care in design and operation of all related facilities is required.

Railway and Highway Safety

Representatives of CN indicated that all shipments of dangerous goods would comply with federal government regulations. Dangerous goods would be identified and a complex system of controls would safeguard against accidents.

In the event of a derailment or other accident where dangerous goods were involved, there would be an emergency response plan, and a team on 24-hour call.

The Review Board is generally satisfied that responses to emergencies related to the railway are being properly planned. Experience gained with past accidents elsewhere should be utilized to ensure that response is effective.

A plan for possible emergencies as a result of highway traffic is needed. This is one area which would require special attention before any final approvals should be given.

Fire Protection

The Review Board is generally satisfied with the fire protection program outlined by Alberta-Pacific.

Conclusions and Recommendations

There must be two lines of defence with respect to dealing with emergencies. The first is to develop safety systems that would minimize accidental releases of toxic materials or other emergency situations. The second is to have an adequate response plan in place when emergencies do occur, to minimize the impacts.

The Review Board is satisfied that the safety mechanisms proposed for the mill site are reasonable and that emergencies should not be a common problem. A well trained staff, aware of the ramifications of serious accidents, would be of great benefit in this regard.

The Review Board is satisfied with the emergency response plans described by Alberta-Pacific and others who would be involved. Understandably, at this stage the plans are relatively general in nature. If the mill proceeds, detailed emergency response plans must be developed. They must satisfy Alberta Environment and other government departments, and they must have involved the public in their preparation. Additionally, the public must be aware of how the plans would operate in the event of an emergency. The local liaison committee would be expected to be involved in this matter.

To ensure that adequate emergency response plans are in place prior to plant start-up, the Review Board recommends as follows:

- Alberta Environment require the identification of all types of emergencies that would require a special response, including those that could happen outside the mill but related to it.

- Alberta-Pacific be required to work with the public and other involved parties in developing an appropriate response to each emergency.

- Emergency response plans must be carefully documented and knowledge of them be widely disseminated, not only to workers, but to the public that could be affected by an emergency.

6.11 Potential Effects to the Health of People in the Area

The preceding sections discuss many possible effects on the area surrounding the proposed mill and on its residents. Some of these could affect human health.

The most significant potential health effect, aside from those related to the river and dealt with in Section 4, relates to emissions to the atmosphere. If emissions are in accordance with the then current provincial and federal standards, there should be no significant threat from this source to human health.

Another area of concern is the landfill, if on-site, and effects of other aspects of the operations on ground and surface water. Again, the Review Board does not see a significant threat to human health, provided that all existing standards are met and providing that toxic wastes, which cannot be disposed of at a landfill, go to specially approved disposal sites.

Because the Review Board does not see the proposed mill as a significant threat to local residents, it does not believe a health study of the area, as requested by some, is warranted. However, to ensure that significant impacts on human health do not occur, and that emission and other standards are met, a careful monitoring program is needed. Such a program must include public involvement, be designed to deal with all potential threats to human health and

the environment, and provide for monitoring prior to construction to obtain baseline data. Monitoring must utilize the best technology available, throughout the operating phase. Results of the monitoring must be made available to the public in a timely fashion and an effort must be made to ensure that the public understands what the results mean. The liaison committee should assist in this regard.

The matters of workers' health and safety were raised by a number of participants. The Review Board recommends that Alberta Occupational Health and Safety takes the necessary steps to ensure that the highest safety standards are in place, particularly related to toxic gases.

7. Other Matters

7.1 Navigable Waters

The terms of reference for the Review Board include an examination of the potential environmental impacts that relate to navigable waters. There was very little discussion of this matter at the hearings or in submissions, and no concerns were raised.

The Review Board understands that approval would be required from the Federal Ministry of Transport under the Navigable Waters Protection Act (NWPA) for any bridge or any structure that enters navigable waters, if it would interfere with navigation. There appears to be at least one such structure, a proposed bridge, in connection with the Alberta-Pacific project. For the bridge, the Federal Ministry of Transport must approve the site and plans.

Also in this project, there are other structures in the form of the water intake and effluent discharge facilities in the Athabasca River. For these, the Minister of Transport would also be involved if they substantially interfere with navigation.

If the project proceeds, Alberta-Pacific must ensure that its plans encompass environmental concerns and meet legal requirements of both the NWPA and the Fisheries Act. Based on the information received, the Review Board does not believe there are environmental reasons why any necessary navigable waters approval for the bridge should be refused. The same is true with respect to the construction and physical presence of the water intake and discharge facilities, subject to the conclusions respecting the effect of the effluent on the river, as described in Section 4.

7.2 Recycling

A large number of participants in the hearings, from essentially all walks of life, raised the need for society to use more products that result from, and are amenable to recycling. The comments were not limited to recycled paper, although that was the major point of reference. Recycling is not a specific part of the terms of reference, but the Review Board is reporting briefly on the matter to ensure that the environmental ministers are aware of the public support shown at the hearings for recycling.

In terms of the Alberta-Pacific proposal, numerous participants suggested the mill should not be approved and that legislation should be enacted that would require the use of recycled paper products. Many references were made to the significant number of jurisdictions in Europe, Asia and the United States that were now requiring some degree of recycled paper for at least some uses.

Alberta-Pacific acknowledged that the demand for recycled paper was increasing, but indicated that it was not sufficient to justify the necessary de-inking facility in Western Canada. Alberta-Pacific stated that the production of various grades of paper, including

recycled as well as bleached kraft, is dictated by the marketplace. If enough consumers voluntarily decide to purchase recycled paper, or if its use is legislated, the pulp and paper industry would adjust to meet the demand.

The Review Board generally supports the concept of recycling, but does not believe the issue to be significant in terms of the decision being made today regarding the Alberta-Pacific proposal.

7.3 Global Warming

The Review Board heard much concern about the effects of forest harvesting on greenhouse warming. While the topic is beyond the Board's terms of reference, it seemed important enough to participants that the Board chose to address it briefly.

Many participants believe that the harvesting of trees contributes carbon dioxide (CO_2) to the atmosphere, and therefore causes global warming. However, it appears that proper reforestation and recycling can minimize such effects. Following cutting, annual uptake of CO_2 by forests should return to pre-cutting values very rapidly. The net CO_2 released to the atmosphere would therefore be the difference between the biomass of the forest before cutting, and that after cutting, once the trees cut or the products made from them are burned or decomposed. If forest biomass were allowed to return to pre-cutting values, the net effect on the atmosphere of that harvesting cycle would be zero. However, if one assumes that a plot will be recut once it returns to maximum biomass, it is clear that the forest industry would be responsible for some of the increase in atmospheric CO_2. However, these releases to the atmosphere do not occur immediately after cutting, but follow the combustion of the products and wastes of the forest industry. Releases could be minimized by efficient recycling of the wood and paper products produced.

Studies elsewhere suggest that some CO_2 may also be released from soils in clear-cut areas, because of warmer soil temperatures. The Review Board heard no conclusive evidence on this topic, and it is under study elsewhere in North America.

A second greenhouse gas, methane, is also released from wetlands and waterlogged soils in the boreal forest. Although methane is much less abundant than CO_2 in the atmosphere, a molecule of methane contributes 20-fold more to greenhouse warming than a molecule of CO_2. Methane is also increasing in the atmosphere at a higher rate than CO_2, and reasons for the increase are not known. It has been hypothesized that minor disruptions of wetland water tables and flow patterns, plus warming temperatures in northern regions, could be responsible for the increase. Alberta has 14.7 million hectares of boreal wetlands, and is probably an important area for emission of methane. The potential alteration of water tables by logging and roadway construction therefore appears worthy of investigation. No evidence was presented to the Board, but the role of wetlands in greenhouse warming is under intensive study at several sites in Canada.

In the Board's view, climatic warming is a serious long-term problem that will require the participation of all industries and political jurisdictions to solve. Several aspects of forestry practices may contribute to greenhouse warming and require investigation—but in a larger context than one specific company or FMA area.

7.4 Endangered Species

A number of participants, primarily local citizens and others concerned with the environment, reported concern for the effects on critical habitat from timber harvesting. This concern repeatedly focused on contaminating the food and the potential for interrupting the habitat and migration routes of three endangered birds; namely whooping cranes, pelicans and peregrine falcons. It may be that this matter is beyond the terms of reference of the Review Board, as it relates to the exclusion of the FMA. However, the Board is directed to examine potential impacts on Wood Buffalo National Park and Indian Reserve Lands, some of which involve critical habitat. Migratory birds are clearly a federal responsibility and one which particularly falls within the Board's mandate.

The Review Board wishes to make the governments aware of the concerns surrounding wildlife, inclusive of endangered species which inhabit Wood Buffalo National Park and other northern areas. To this end, the Board recommends studies be made and prompt action be taken to protect endangered species.

7.5 Timber Harvesting in Wood Buffalo National Park

The Board heard reference to timber harvesting practices of mature, virgin, white spruce in the timber berth 408 in the western section of Wood Buffalo National Park. This timber berth contains an area of approximately 470 square kilometres. According to the Canadian Parks Service, the berth will continue to be operated until the year 2002, when the lease expires.

This matter is beyond the terms of reference of the Review Board. However it draws to the governments' attention concerns that liquidation clear-cutting is being practised in a World Heritage Park.

7.6 Ecological Reserves

A number of participants suggested that there should be land within any FMA area that would be reserved from timber harvesting, and indeed, one group identified specific areas that it believed should be put in ecological reserves. These would be lands which are particularly sensitive or unique environments or habitats. Many of the Aboriginal participants focused their attention respecting this matter on areas of important habitat which are critical to the ongoing existence of wildlife.

Alberta-Pacific indicated that there would be many areas within the proposed FMA which would never be harvested. In fact, some 50 per cent of the total area would not be cut for one reason or another. Alberta-Pacific did indicate, however, that it was the Alberta Government, through the terms of the FMA, which would decide those areas to be harvested and those to be reserved.

The details of the FMA are beyond the terms of reference of the Review Board. However, it is recommended that the matter of ecological reserves within the FMA area be considered as part of the ongoing process.

8. Effectiveness of Responses to Citizens' Concerns

The Review Board's terms of reference required it to assess the effectiveness of Alberta-Pacific's responses to citizens' concerns. In order to do so in a meaningful way, the Board also found it necessary to consider the public's concerns about government departments and the review process used by the Board. Below, we assess these three factors. In addition, we make recommendations to improve the conduct of future review processes.

8.1 Actions by Alberta-Pacific

Public concerns about Alberta-Pacific and Alberta-Pacific's actions in dealing with those concerns should be understood in the context of the changing nature of the review process for the project. In the beginning, public involvement was expected to be much less than what ultimately took place. For the limited review anticipated in early 1989, Alberta-Pacific's public meetings and open houses were seen by some as reasonable. Indeed, for the FMA public involvement program originally anticipated, these may have been satisfactory.

Alberta-Pacific's meetings consisted of open houses, technical workshops conducted in the vicinity of the proposed mill, attendance at Alberta Forest Service Information workshops and meetings with interested parties around Alberta. At that time a detailed environmental review was not expected. A dramatic change in the process of public involvement in the environmental review of this project occurred from the time of announcement of the project in December, 1988 to the time of the public hearings held by the EIA Review Board. This necessitated a major change in the approach taken for public involvement by Alberta-Pacific.

Moreover, as the public hearings revealed what the Board and the public wanted, the proponent adjusted its approach, participating more fully and openly. Alberta-Pacific also suffered from the generally bad reputation of the pulp and paper industry. The public perceives pulp mills as smelly places with associated water quality problems—an image which Alberta-Pacific admitted was fair for older mills.

People living in the immediate mill area had considerable contact with Alberta-Pacific. Contacts ranged from land acquisition to proposals for involvement in environmental management schemes for the mill.

Aboriginal Peoples in the FMA area also met with the proponent. Their concerns included impacts on their lifestyle and on their lands from either the mill operation or from forestry practices, and opportunities for Aboriginal employment. Alberta-Pacific's meetings with Aboriginal groups did not seem to alter Aboriginal perceptions of the project or to satisfy their concerns. The one important exception to this lack of satisfaction is the agreement reached with the Janvier Indian Band in January, 1990 to enter into a logging contract conditional upon project approval.

Northerners in the far downstream communities were involved also, but in a much less significant manner. Alberta-Pacific consistently expressed the view that its mill would have no impacts beyond Fort McMurray and so expended little efforts farther downstream.

Some participants at the public hearings indicated that they were fully satisfied with the proposal and with the Alberta-Pacific responses to the concerns raised. Others, however, indicated that the Alberta-Pacific public involvement program was much less effective than might have been expected. The Board believes that there were two reasons for this lack of effectiveness.

First, there was insufficient public involvement during the preparation of the environmental impact assessment, which was quite rushed. This lack of early public contact is believed to be in part at the request of the Alberta Government which apparently did not want the matter discussed in public at the preliminary proposal stage. In this case, it led Alberta-Pacific to conclude *"...where there is no established administrative infrastructure the proponent will be caught between adherence to limited guidelines and the mounting public expectations for information and input."*

Second, there was a distinct lack of formal specific commitment behind the Alberta-Pacific responses. The following examples are offered as reasons for this view. Alberta-Pacific discussed the possible formation of committees involving the public, but these committees lacked any decision-making authority and were perceived as offering no assurances to the public. Alberta-Pacific adopted policies promoting Aboriginal employment, but declined requests to provide a firm commitment to employment equity in dealing with the Aboriginal People. The company indicated that such action, if appropriate, would be taken only after approval of the project. Again this led the public (and the Aboriginal People in particular) to believe that there would not be significant Aboriginal employment.

Alberta-Pacific also seemed unwilling to work with local public representatives to adjust the project location and design or to study possible impacts identified by the public (e.g., doing fisheries studies). Some AboriginalPeople, who are particularly concerned with the impacts of forest harvesting on them and on their lands (including impacts on water, fish and other natural resources), indicated a strong desire to be involved in the FMA negotiations in ways which would allow them to be more certain that their interests were being properly addressed. Alberta-Pacific seemed unwilling to involve Aboriginal People, stating correctly that the FMA development process is the responsibility of the Alberta Government. Past experience and the fact that FMAs are negotiated in private between the proponent and the Alberta Government, and excludes Aboriginal People, has led Aboriginal People and the public to the conclusion that Aboriginal interests were not being addressed.

Alberta-Pacific's reluctance to develop detailed co-operative agreements until approvals are in place seemed to have severely limited its effectiveness in dealing with the public. Co-operative working arrangements are necessary in order for a proponent to win public confidence in the late 1980s and early 1990s. The costs of such measures are considerable, but public confidence in the project and a greatly improved working relationship between the proponent and the public would result, and be expected to continue during the operations phase of the project.

While some participants in the review indicated a complete confidence in the proponent, others showed a distrust of Alberta-Pacific throughout the hearings. From this latter group, firm commitments were sought for a meaningful decision-making role in the environmental management of the project, but this was resisted. Firm goals for Aboriginal employment were requested, but Alberta-Pacific declined to take a stand which would satisfy these requests.

People in the Northwest Territories were virtually ignored by the proponent prior to the creation of the EIA Review Board—in spite of great concern shown there.

The Review Board recommends that proponents in environmental reviews should be expected to enter into detailed agreements with the public and with governments about how public concerns would be dealt with if the project were to proceed. Means of promoting these goals will be suggested in Section 8.3.

8.2 Role of Various Governments

If members of the public generally indicated a distrust of the proponent, they did not show any greater confidence in governments. The Alberta Government, in particular, was seen as approving the proposed mill without any credible public involvement, where the public could provide input upon which the decision would be based. The feeling was that only public pressure had forced the government to hold hearings. Government's regulating of industry generally, and the pulp and paper industry in particular, was regarded by many participants as being far from adequate; standards were believed to be too low and inadequately enforced.

Concerns were also raised about the lack of research done by government agencies on the river and the agencies' apparent inability to regulate industries using the river (including both the proposed Alberta-Pacific mill and other pulp mills, existing and planned) to protect the environment. Standards for dissolved oxygen seemed to have been set without adequate knowledge of the implications for fish, and the regulation of chlorinated organics seemed to be set without full regard for environmental consequences. In fairness to governments, it must be noted that the presence of toxic chlorinated organic compounds in pulp mill effluent has only been recently detected. The Board believes that governments, as well as proponents, have a responsibility to undertake preparatory studies prior to major developments. The public reaction at the hearings suggests that these responsibilities have not been satisfactorily handled in the case of pulp mill developments in Alberta.

A number of participants noted that Alberta-Pacific's projected performance standards were more environmentally rigourous than those met by other mills in Alberta and elsewhere in Canada. They suggested that the Alberta and federal governments should strengthen the environmental standards for pulp mills throughout the country and that those standards should be rigourously enforced.

8.3 Effectiveness of the Environmental Review Process

Because the environmental review process used was developed specifically for this proposal, the Board believes that it should indicate what features of the review worked well and which are in need of improvement. In this way, the EIA process to be used in Alberta for future environmental reviews can benefit from what has been learned. The comments in this section cover the formal EIA process and are intended to apply to major projects with significant potential for environmental impacts. Modifications would be made for smaller projects.

Need for Public Review

The Board was overwhelmed with public interest everywhere it went. Such large numbers of public participants wished to be heard that extraordinary efforts were required to deal with them. Extra hours of hearings were added on hearing days; extra hearing days were added; and reduced questioning of public participants was used in order to hear from the larger-than-anticipated number of public participants.

While some participants were not well informed prior to the hearings, public contribution to the Board's recommendations was considerable. Members of the public presented information which was complementary to, but different from that presented by the proponent and by governments. Accordingly, the Board believes that an opportunity for the public to be heard in cases of an EIA being reviewed should be an essential feature of the EIA process, rather than an addition to be implemented in an ad hoc fashion for selected reviews only.

Similarly, and for the same reasons, the Board believes that the approach to be used by Alberta to develop the FMA for this project should be one involving explicit and formal input from the public. This should be done in a manner which provides the public with direct access to the FMA decision-makers and more importantly, which provides the decision-makers with direct access to the public. Future FMA public hearings should not be separate from those conducted for any related development, such as a pulp mill, but the two should be combined into one. Only by dealing with all components of the project at the same time can sound overall decisions be made.

An important principle of environmental impact assessment is that the results of the environmental review must be able to influence the decision about the proposal. Throughout these hearings, the public expressed concerns that the Alberta Government had already taken the decision to proceed. All participants in the Alberta EIA process (public, proponents and governments) must understand that decisions on proposed projects will not be taken until after the environmental review is completed, and that the information presented in the environmental review (including the public hearings) will represent an important consideration in that decision. Any preliminary government approval must be understood to be approval only to proceed to regulatory review.

The public distrust of both industry and government is, in the Board's view, sufficient reason for conducting hearings before a panel (or board) which is independent of both the proponent and of government. Such independence seemed to increase public confidence in the review.

The Review Process

The process adopted for this review was not entirely satisfactory either to the Review Board or to the public, and probably not to the applicant. Major concerns were expressed concerning such matters as the haste with which the hearings were conducted, the means of providing funding for hearing participants, and, especially, the terms of reference of the Review Board.

Participants objected to what they perceived as the undue haste in conducting the hearings, because they had insufficient time to prepare, or to read the documentation provided. This complaint is common at many hearings, but the Board believes that the complaints were partly justified in this case. The timing of the hearings was prescribed in the Board's Ministerial Order and resulted in an earlier start for the hearings than would have been preferred. A somewhat greater review time should be provided. The time of 45 days after receipt of initial documentation in hearing communities was suggested. The Board believes that 30 to 90 days, depending on the complexity, would be a reasonable guideline.

Several of the problems associated with this review could be overcome by an earlier start and a more careful approach to the environmental review. A review panel should be selected as early as possible. The panel, a portion of the panel, or an appropriate government department should be involved in scoping the EIA. Scoping would identify, through consultation with the public, the proponent and government representatives, the issues which are important to address in the EIA. This would most likely be done through public meetings, after which the proponent would be provided with a set of guidelines for the EIA documents. In addition, the proponent would get to see first hand what the public concerns are and to know the people with the concerns.

An EIA developed in co-operation with members of the public will be more likely to lead to a satisfactory outcome for both proponent and the public. Indeed, the proponent should be encouraged to resolve as many concerns as possible during the preparation of the EIA. For a forestry project such as this, the substantial expertise regarding forests, wildlife and the land possessed by the public in general, Aboriginal People and Aboriginal Elders, in particular, could then be applied to preparation of the EIA.

Once the panel is convinced that the EIA documents are satisfactory as the basis for a public hearing, the hearings may be scheduled. Appropriate time must be scheduled for public review after dissemination of the initial materials.

Several participants in the review suggested that the preparation of the EIA should be done not by the proponent, but by an independent third party. The Board does not take a position on this matter. On the one hand, the suggestion would reduce the apparent conflict of interest of proponents. On the other hand, there are clear benefits to having the proponent undertake the EIA preparation. The proponent can undertake this work early in the planning process, can use all information it has about the proposal in preparing the EIA, and can use the EIA results to improve the proposal. The Board concludes, however, that, whoever prepares the EIA, it is essential for all participants in the review process to understand that the EIA will subsequently be reviewed openly and publicly by an independent panel.

Funding

The provision of funding for participants in the Alberta-Pacific hearings was done independently of the Review Board by Alberta Environment through a variety of local governments, and by the Government of the Northwest Territories in that jurisdiction. The criteria developed for evaluation of funding applications seemed reasonable. However, some participants objected to the lack of funds for those who were in favour of the mill. The amount of funding provided, approximately $306,000 between the Alberta and Northwest Territories governments, appeared fair, but the lateness in announcing the funds, and the short lead time prior to the start of the hearings created a legitimate concern about the funding process. The Board also understands that the Alberta Government has been very late in providing the funds. This is most unfortunate. Concerns were also expressed by participants about the fairness in allocating funds.

The provision of participant funding is extremely important for effective environmental reviews. Funds must be available for both the scoping sessions and the subsequent public hearings. Eligibility criteria for this funding must be developed and made known early. The funds should be allocated by either the panel itself or by an independent funding allocation committee. Providing these funds should be an obligation of the proponent, but the proponent must not exercise any control over their allocation. Not only must the allocation of such funds be fair, but it must also be seen to be fair.

One aspect of the Alberta Government offer of support for hearing participants surprised the Board. In addition to funding, government expertise was offered to participants. Such expertise appears to have been used very rarely in spite of the fact that it would have been of considerable value for several participants. Greater efficiency could have been achieved if more use of such government experts had been made by participants.

Terms of Reference

The most serious criticism of the process related to the terms of reference given to the Board. The explicit exclusion of effects of forest harvesting was of great concern to many participants who argued that it was simply not meaningful to review the proposed project without examining the implications of obtaining the feedstock for the mill. The Board agrees fully with this criticism.

The principle of using an ecosystem approach to environmental management demands more holistic terms of reference for environmental reviews. (An ecosystem approach is one which includes full consideration of all components of the environment and of the proposed development at once, rather than an approach which attempts to analyse different components in isolation. An example of an ecosystem approach used by some jurisdictions is management by watersheds.) The decision-makers who decide whether to approve this project need to know what the environmental (biological, physical, social and economic) consequences will be of the operation of the project. This clearly implies the need for inclusion of forest harvesting in the environmental review. The suggestion that such a review can be done separately—at a later time by a separate agency—seems to the Board to violate the principles of good environmental impact assessment and of good management.

The reasons for rejecting the separation of pulp mill and forestry reviews are many and have been alluded to earlier. It is not meaningful to separate the impacts due to forest harvesting activities which affect water quality and fisheries from those of the mill which affect water quality and fisheries. Attempts to do so are not acceptable to the scientific community or the public and create the need for substantial duplication of effort. The claim by Alberta Forestry, Lands and Wildlife that an EIA is inappropriate for forestry projects is not accepted by the Review Board. The input obtained through the EIA process is essential to making good decisions about the proposal at the time of application. The need for two sets of public hearings on the same proposal is also wasteful of government, proponent and public resources. The potential of successful legal challenges of review processes which are incomplete in addressing all relevant issues is also of concern.

The Review Board believes that, in order to avoid costly and time consuming repetitive hearings, or even legal challenges to decisions, it is important to ensure that future EIA processes are conducted in a legally sound manner. The public now claims a right to, not only a hope for, environmentally sound decisions.

The following four principles should be included in determining whether an EIA for a forest related project is conducted legally.

First, at the earliest stages of the EIA process, an ecosystem approach should be used to ensure that a comprehensive review of environmental impacts is conducted. The information on which the review is based should be accurate, relevant, and based on scientifically valid procedures. By definition, the ecosystem approach will use a holistic assessment of the interacting components of air, water, land and organisms, including humans.

Second, principles of sustainable development should be incorporated into the planning and review of projects. Sustainable development has now been incorporated into new federal forestry legislation; it is a principle which has gained nationwide acceptance.

Third, clear and complete terms of reference which incorporate these principles, and other relevant matters, are vital to the public review of the EIA.

Fourth, future projects of this type should be based on increased public involvement and should include an analysis of the following, along with other issues:

- non single point, diffuse discharges from, or to, the project area, including inputs to the watersheds;
- thorough study of forest activities as they affect other natural resources and especially water quality;
- air, land and water interactions;
- scrutiny of the fish, plants, and wildlife resources including proper baseline studies, identification of endangered species, critical or unique ecosystems or habitats, and migration patterns; and
- social and economic considerations.

Another criticism of the terms of reference was that the project justification and alternatives to the project could not meaningfully be addressed. For future environmental reviews, the panel should be empowered to make recommendations regarding virtually all aspects of the proposal. This would include an assessment not only of biophysical and socio-economic impacts, but also of possible alternatives, the consideration of economic benefits and a cost-benefit analysis. This would provide the decision-makers with better and more complete information on which to act.

The Review Board

As noted earlier, an independent review board is an important contribution to the conduct of a credible review. Selection of board members is clearly a relevant and important consideration. The Alberta-Pacific Review Board is composed of members with a variety of expertise relevant to the proposal. There are members from the immediate area of the mill; members from downstream areas; members with specific knowledge of scientific and technical impacts relevant to the proposal; members with an understanding of Aboriginal culture and lifestyles; and members with an understanding of environmental impact assessment processes and public hearing procedures. This combination of expertise has allowed Board members to share ideas and to promote understanding of the issues by the full Board. However, with eight members, it is a large Board, and a somewhat smaller one should be considered for future reviews.

It is helpful to have Board members who see things from a particular perspective, but there should not be members as advocates for a particular view. It is crucial that the Board function not as a number of individuals, but as a team. It is important that both genders be included.

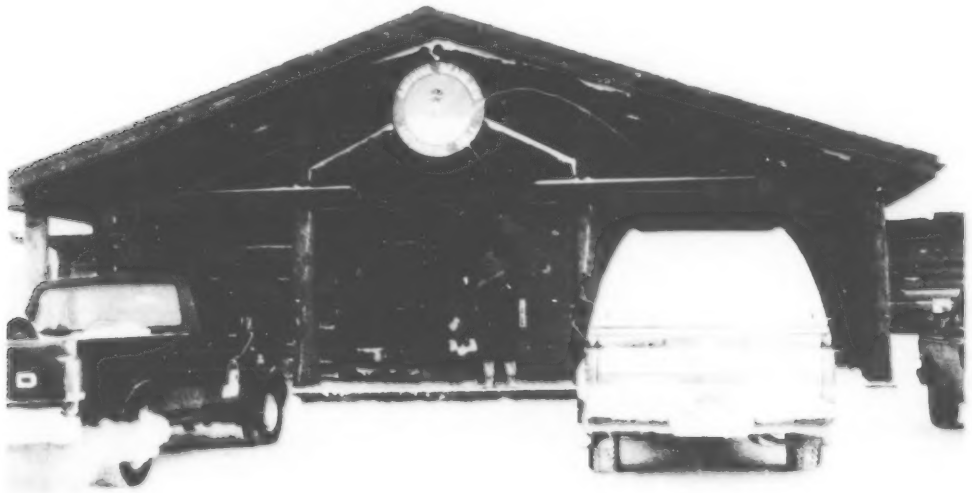
Other criteria for selection of members includes identifying members who have a lack of vested interest regarding the project, which is essential for the credibility of the review. Members should also have an appreciation of, and respect for, the integrity of the review process, including the public hearing procedures. Review Board members must be available so that the process can proceed without undue interruptions. Regarding availability, the number of "public" members with other commitments can influence collective availability. Many public members can result in less collective availability but more independence of government; tradeoffs may be needed. For this Review Board, these conditions were reasonably met.

The Review Board was established in order to conduct the environmental reviews required by both the Government of Alberta and the Government of Canada. The selection of a common review mechanism, as was used here, is clearly superior to two independent reviews, and appears to the Board to have worked well. The appointment of members to a single Board by each of the Alberta and federal governments, with the greater number of members chosen by the government having the primary jurisdictional responsibility, appears to be a suitable mechanism for future reviews. In this respect, it should be noted that the Board members, having been appointed by different governments, did not play different roles on the Board; they became members of the Review Board with a common responsibility. The inclusion of a Board member appointed by the Northwest Territories was also a significant and very positive choice, given the potential effects of the project and the public concerns about those effects in the Northwest Territories. This sort of a mechanism should be viewed as a model for environmental impact assessments involving transboundary issues.

The Hearings

The Review Board held hearings in 11 different locations. The costs of the hearings was considerably increased by the choice of many hearing locations rather than a single location. Not only are travel, organization, administrative and set-up costs incurred, but there is also a need for duplication of parts of the hearings to deal with different members of the public in different locations. These costs, however, are offset by benefits which accrue from the choice of multiple location hearings. The information presented to the Board was different in each of the hearing locations. Thus, a greater diversity of ideas and public concerns was obtained by going to the 11 different locations. This is especially important for hearing from Aboriginal communities; the Elders and the children are an important part of the community and they contribute meaningfully in their own communities, but are reluctant to do so elsewhere. The Board believes that the hearings were much better and more credible as a result of the choice of multiple hearing locations.

For future reviews, the following treatment is suggested as a means of dealing with more than one hearing location. Scoping sessions need to be held at several locations in order to assure reaching all major stakeholders. The actual hearings themselves should start with the presentation of technical materials in the most suitable central location. Following this, community hearings should be held at all other locations deemed necessary by the panel, but for the primary purpose of hearing from the public, not of hearing more technical information. With the information presented at the technical sessions, the presenters at remote hearing locations could be well informed and prepared for the community hearings. This assumes that the transcripts and hearing documents are made available at each hearing location, as was done for these hearings, and that sufficient time is allowed for review. Then, following these community hearings, the hearings would finish in the central location with the panel members drawing on the information submitted at the community hearings to ensure all issues are addressed.



Antoine Beaulieu Memorial Hall in Fort Resolution, N.W.T., one of the 11 communities in Alberta and the N.W.T. where hearings were held.

In order for environmental reviews to be effective, it is essential that sound scientific and technical, as well as policy advice be provided from the relevant government agencies. The Review Board was generally satisfied with the co-operation it received from government departments. Alberta Environment was present at all hearings and made itself available to answer questions and provide such information as it could; this approach was exemplary. The federal departments of Environment and Fisheries and Oceans were also represented at many of the hearings and provided valuable information to the Board. The Government of the Northwest Territories was very helpful to the Board. Other agencies of both the provincial and federal governments (such as Indian and Northern Affairs Canada, Alberta Transportation, CN Rail, Health and Welfare Canada and Alberta Public Safety Services) provided useful inputs at the hearings and in writing. Aboriginal governments, municipal governments, and regional government agencies were also helpful.

One government agency with specific responsibilities relevant to the project and to the mandate of the Review Board was not as helpful to the Board as it should have been. Alberta Forestry, Lands and Wildlife did not participate extensively, primarily because it took the position that the FMA, for which it is responsible, is to be handled by a different review process. However, the same department is directly responsible for fisheries and wildlife in the province. Both fish and wildlife were significant environmental concerns for this review, were clearly within the Board's terms of reference, and yet no representatives from the department were made available to address these issues. Also within the Board's terms of reference were the effects of forest harvesting practices on Indian Reserve Lands. This matter led to frequent requests for participation from Alberta Forestry, Lands and Wildlife, but there was only very limited response from that department.

While the Board believes that it was able to get sufficient information from other sources to address the concerns for which Alberta Forestry, Lands and Wildlife has responsibility, future environmental reviews will benefit from the input from all agencies of government with relevant responsibilities.

Expert and Other Assistance

While members of the Board did have expertise related to the project under review, it did not have all of the expertise needed and it is likely that no environmental assessment panel ever will. In order to overcome this difficulty, the Board made use of technical advisors as was identified in Section 1.5. The ability of a review panel to use such technical advice is important both to increase the quality of information provided and to add to the credibility of the review.

The provision of high quality secretariat support for the Board was essential to all of its tasks. This support consisted of handling public inquiries, booking meeting rooms, distributing documents to the public, making travel arrangements for Board members, and a host of other tasks necessary for the operation of the review.

The Board is extremely grateful for the help it has had and urges all future environmental review panels to pay great attention to the secretariat. It would also be wise for the Alberta Government to develop such expertise for use in environmental reviews. This expertise could be made available to review panels from an established, independent agency which would have staff experienced in arranging hearings, dealing with the public, distributing reports and

other duties relating to the public hearing process. The experience of panels regarding useful, and not useful, procedures could then be passed on to future panels through secretariat members.

8.4 Conclusions and Recommendations

The early Alberta-Pacific efforts at dealing with public concerns were not very successful in part because of government direction. The preparation of the EIA was hurried and had unfortunately little public involvement. During the environmental review and public hearings conducted by the Board, however, Alberta-Pacific's dealings with the public became quite effective and benefits resulting from a better exchange of ideas and information could be seen. Had this approach been adopted earlier, the benefits might have been considerable.

Many government agencies from many different governments were involved in the review and contributed much useful information. It is equally certain that the participating governments gained much in terms of understanding public concerns about the proposed mill and about the government approach to environmental matters. Review panels such as this need access to expert assistance and much of the technical assistance can be provided by government agencies.

The process used was reasonably effective, in the Board's view, but a number of changes would help to improve the process. These changes are described above and summarized here.

- If preliminary approval is given by government prior to the EIA process, such approval should be clearly understood to be approval only to proceed to regulatory review.

- Prior to decisions being taken, public hearings should be held for all major proposals requiring an EIA.

- When public review of an EIA is required, an independent review panel should be designated with panel selection criteria generally as presented in Section 8.3.

- The review panel should be empowered to investigate and make recommendations regarding biophysical and socio-economic impacts, possible alternatives to the proposal, economic benefits of the proposal and a cost benefit analysis. This would provide decision-makers with better and more complete information on which to act.

- Scoping meetings should be conducted at the beginning of the EIA process to identify the issues to be dealt with in the EIA.

- There should be meaningful input in the scoping sessions and in the preparation of the EIA by those most directly affected by the proposal, as well as a reasonable opportunity for input by a broader segment of the public. Efforts should be made, and resources should be made available, to resolve as many problems as possible before the hearings are scheduled.

- Adequate time should be made available for public review of documents provided before holding a public hearing. Depending on the complexity of the matter, this should be 30 to 90 days.

- The EIA should be prepared by the proponent or by a third party but it must undergo a thorough public review conducted by an independent panel.

- An ecosystem approach should be used for environmental reviews.

- The division of a project into different segments for public involvement purposes, such as the mill and the timber harvesting operations in this case, should not be done.

- If two or more jurisdictions are involved, serious efforts should be made to combine the public reviews into one, as was done for this project.

- Funding for participants must be available for both the scoping sessions and for the subsequent public hearings. Eligibility criteria for the funds must be made known and, while those most directly affected by the proposal must clearly have access to such funding, others may also be considered for funding if they can make helpful contributions to the review. The funds should be provided by the proponent but should be allocated either by the panel or by an independent allocation committee.

- For reasons of efficiency, the number of hearing locations should generally not be great. If multiple hearing locations are required, the method of technical sessions and community hearings outlined in Section 8.3 should be considered.

- A review panel for a major project requires administrative, technical, legal and other assistance. It would be beneficial if such a panel could operate under the auspices of an established independent agency which has such qualified staff.

- Environmental review panels require the expertise and advice of government agencies with relevant responsibilities. The panel must also be able to obtain its own technical experts to review aspects of the material, when it deems such independent advice to be needed.

9. Summary of Major Conclusions and Recommendations

9.1 Overall Conclusions

The pulp mill proposed by Alberta-Pacific, if constructed and operated in accordance with the detailed information provided by the proponent, would be one of the safest of its kind, in terms of environmental impacts, anywhere in the world. However, it would be a bleached kraft mill which uses chlorine as a bleaching agent, and there would be environmental impacts related specifically to the formation of chlorinated organics as well as to other aspects of the operation. Many impacts would not be serious enough to withhold approval for construction of the mill because they could be mitigated to an acceptable level. There are, however, other potential impacts which are of serious concern to the Board.

The most important of these is the discharge of chlorinated organic compounds to the Athabasca River. While the processes proposed by Alberta-Pacific would minimize the production of chlorinated organic compounds, the large capacity of the mill makes the likelihood of an unacceptable degree of contamination high, in particular since the cumulative impacts of existing mills have already resulted in measurable contamination of the fishery with dioxins, furans and other toxic chlorinated organic compounds. Both the degree of contamination of the river system with chlorinated organics, and the hazards posed to humans and lower organisms need to be better characterized.

The Board also has concerns about whether dissolved oxygen concentrations in winter would be high enough to maintain the fishery and biological community of the Athabasca River.

The Review Board therefore recommends that the proposed pulp mill should not be approved at this time, even though it recognizes that the mill would have beneficial economic impacts on the Athabasca-Lac La Biche region and on the province. The Board also recommends that major studies be undertaken to provide a better understanding of chlorinated organic compounds, the distribution and habitats or organisms, and the need for dissolved oxygen in the rivers.

Alberta-Pacific requested that any new environmental standards or requirements should be applied only to future pulp projects. The Review Board understands why such a request might be made, because the extent of review and the requirements imposed on Alberta-Pacific have changed greatly since it initially proposed the project. However, the major areas of concern to the Review Board have a very real potential to affect not only the natural environment, but also the health and well-being of residents of northern Alberta and the Northwest Territories. For this reason, the Review Board believes that the results of the further work it is recommending should be imposed on Alberta-Pacific as well as on future projects.

Alberta-Pacific, in its final submission, appeared to be taking the position that the mill should be approved, as proposed, and that further environmental upgrading might be expected in future. It specifically stated *"...this project has been consciously designed to be retro-fitted for new measures which may be developed in the future and which may further enhance environmental protection."* The Review Board believes that the flexibility to retrofit is an important

asset to the project and wholly endorses it. However, because of concerns that the cumulative effect on the river system could prove to be unacceptable, as well as the lack of information on which to draw conclusions respecting possible effects on human health, the Board does not believe that the aforementioned flexibility would justify approval of the mill at this time.

9.2 Conclusions Respecting Specific Terms of Reference

9.2.1 Cumulative Environmental Impacts of Effluent Discharges on the Peace-Athabasca River System

The principal area of concern to the Review Board is the effluent which would be discharged to the Athabasca River, and hence flow north through Lake Athabasca, the Slave River and into the Northwest Territories. The most serious potential effect of the effluent discharge relates to the chlorinated organic compounds which are formed in the pulping process. Although the chlorinated organic content of the effluent, per unit of pulp production, would be low for the proposed mill when compared to older existing mills, the size of the mill means that it would total some 1,500 kg per day. In the years ahead, the mill would be the largest single source of organochlorines to the river.

There is much uncertainty regarding the details of the specific compounds which would be contained in the effluent, and their toxicity, bio-accumulation, and persistence in living organisms. Also, the safe levels for many of the chlorinated organic compounds are not known. There would be some dioxins and furans in the effluent and they would represent a potential hazard to users of the river. Additionally, results of analyses provided to the Review Board during the hearings indicate that there are already significant amounts of dioxins or furans in fish taken from several locations in the river system. These include the Athabasca in the vicinity of the Weldwood pulp mill at Hinton, the Wapiti near the Procter and Gamble mill, and the Peace below British Columbia mills. Fishes of the Slave River more than 1,000 km downstream from existing mills are also detectably contaminated. This confirms that these compounds are bio-accumulating in fish. In some cases, current levels of 2,3,7,8 dioxins are very close to the safe level for fish consumption as recommended by H&WC. There is cause for concern because of the concurrent high levels of 2,3,7,8 furans in some samples. When these furans are adjusted to 2,3,7,8 dioxin equivalents, this seriously adds to the concern. That concern is increased by the knowledge, based on many submissions at the hearings, including H&WC, that the fish portion of the diet for Aboriginal People in the north is much greater than for average Canadians, and thus health effects could take place for correspondingly lower concentrations of the compounds in fish. (The matter of chlorinated organics is discussed in Section 4.1.)

An additional concern regarding the effluent from the mill relates to possible lowering of the dissolved oxygen level, thus reducing the ability of fish to survive. Data and predictions presented to the Review Board indicate that some stretches of the river system may even now have insufficient dissolved oxygen with only the existing pulp mills and other sources of oxygen-using organic substances. New requirements are being imposed on existing mills and

those under construction, and this will assist in raising dissolved oxygen levels. Also, there are mechanical and other ways of adding oxygen to rivers if further improvement is needed.

A major problem, however, is the existing uncertainty as to what the appropriate oxygen level should be in order to protect aquatic life. The standards recommended by Environment Canada are different from those used by Alberta Environment, although the latter are under review. The appropriate level can best be determined by knowing the species of fish that exist in the river and the oxygen level required for their survival. (Dissolved oxygen is discussed in detail in Section 4.2.)

There are also potential problems respecting the taste of water and fish tainting, and lesser problems related to nutrient loading in the river and possible concentrations of trace metals. (These matters are reported on in Section 4.3.)

The potential effects of chlorinated organics on downstream users are, in the Review Board's judgement, the most serious environmental problem related to the proposed mill. The Review Board believes the mill should not be approved until further scientific work is carried out on the river system. The work should include a detailed assessment of existing levels of chlorinated organics in fish and other aquatic life and a review of the applicability of existing standards to Aboriginal populations. Because of other potential problems, it should be expanded to include study of fish species, determination of proper dissolved oxygen levels for various segments of the river, and development of appropriate models to manage the river system in a manner which will meet the required levels.

Due to the critical nature of the river to downstream and other users, and the roles played by different jurisdictions in managing the Athabasca-Peace-Slave River system, the Review Board believes the scientific work should be under the broad direction of a management team with representation from all major stakeholders. These would include the Alberta and other provincial governments, the federal government, Government of the Northwest Territories, downstream towns and cities, Aboriginal people and their governments, and the industry. (More details respecting this matter are provided in Section 4.)

9.2.2 Effects of Timber Harvesting Practices on Indian Reserve Lands

The Review Board found it difficult to assess the impact of timber harvesting because of the separation of the environmental review of the proposed mill from the review of the proposed FMA. Information regarding the FMA was not available in sufficient detail to allow final conclusions regarding the overall environmental acceptability of the forestry proposal as it relates to Indian Reserve Lands.

A review of submissions convinces the Board that potential impacts of forestry operations on Aboriginal People and their lands would be significant. They would include direct impacts on species of trees and other plants, on wildlife and on hunting and trapping. They also include possible indirect impacts, for example on land claims and the spiritual relationship between Aboriginal People and the forest. There is much potential for social impacts, both good—through business and job opportunities—and bad, as so often has occurred when industrial developments interface with the Aboriginal way of life.

All of these effects are potentially so significant that the Review Board believes the Aboriginal People should be extensively involved in negotiations and preparation of the FMA. The FMA should be given a thorough public review before approval, but prior to that, representatives of Aboriginal People should be included in the preparation of the FMA and the assessment of the environmental impacts of the forest operations.

The Board is of the view that approval of the proposed mill should not take place until the environmental assessment and public review of the FMA are complete, and it is concluded that an adequate supply of wood could be made available to the mill in an environmentally acceptable manner. (Effects of timber harvesting on Indian Reserve Lands are dealt with in Section 5.)

9.2.3 Other Environmental Impacts of the Proposed Mill

The proposed mill would have a number of environmental and social impacts on the immediate community where it is proposed and on the general Athabasca-Lac La Biche region. These would relate to many aspects of the project including the manpower requirements during construction, gaseous emissions to the atmosphere, odours, solid waste disposal, surface and ground water, aesthetics and noise, and necessary infrastructure, such as roads, railways and pipelines.

On the basis of its assessment, the Review Board believes all of these matters could be managed in an environmentally acceptable manner, provided that strict conditions are developed and enforced and that communications between all involved parties are open and effective. However, the Review Board is concerned that the site selection process utilized by Alberta-Pacific did not sufficiently consider the extra environmental and social problems which would occur because of locating the mill in an existing agricultural community. Although the development costs of a more remote site would be greater, the Review Board believes a more detailed assessment of the proposed site, versus an appropriate alternative, should be conducted before approval is given.

If the mill proceeds in the proposed area, a liaison committee should be formed. It should include representation from the mill operator, community, local governments, Alberta Environment, and other significant stakeholders. The committee should be sanctioned and sponsored by the Alberta Minister of Environment and should have meaningful input into the planning and conduct of operations, with the objective of minimizing environmental and social problems. (The environmental effects of the proposed mill are dealt with in Section 6.)

9.2.4 Effects On Water Quality in the Northwest Territories

As indicated in Section 9.2.1, the Review Board concludes that further scientific work on the river system is necessary before the mill should be approved. Chlorinated organic compounds could affect water quality and aquatic life in the Northwest Territories, and therefore representatives of its government should be involved in the scientific work. The mill should not proceed until it is demonstrated that the water quality in the Northwest Territories will not represent a hazard to users either directly or through food contamination. The Board also believes that transboundary agreements should be developed. (This matter is discussed in Section 4.1.)

9.2.5 Effects on Wood Buffalo National Park

Fish and wildlife in Wood Buffalo National Park could be affected if the water in the Athabasca-Peace-Slave River system is polluted. This concern would be dealt with through the additional scientific river work recommended by the Review Board.

There is also a potential for impact on wildlife in the park, particularly endangered species, due to the timber harvesting operations to the south. These should not be so serious as to cause the project not to proceed, but should be considered in the review of the FMA. (Effects on Wood Buffalo National Park are discussed in Sections 4.1, 4.4 and 7.4.)

9.2.6 Effects on Fisheries

Fish would be affected by the quality of the water in the river system. Recognizing the importance of fish in the diet of northern Aboriginal People, as well as the commercial potential, fish and the food chains and habitats they require should be a focal point of the scientific river studies recommended by the Review Board. Any necessary approvals under the Fisheries Act should, presumably, be dependent on the results of the recommended work. (See Section 4 for further details.)

9.2.7 Effects on Navigable Waters

A major bridge, and water intake and effluent facilities, would be subject to the Navigable Waters Protection Act. The Review Board is unaware of environmental reasons why approval of these facilities should be refused. (See Section 7.1.)

9.2.8 Effectiveness of Responses to Citizens' Concerns

Alberta-Pacific made a considerable effort to deal effectively with public concerns once the Review Board had been appointed and the process commenced. However, it was inhibited somewhat by the degree to which the review process changed from the time of its preliminary proposal through to the completion of the hearings.

Notwithstanding the efforts made by Alberta-Pacific to respond to concerns during the hearing process itself, the Review Board concludes that the proponent would have been more effective had it taken greater time during the preparation of the EIA and communicated more extensively with the affected public during that phase of the project.

The Review Board believes the process which it followed was reasonably effective in terms of the environmental review. The roles played by government departments were generally acceptable, bearing in mind that this was somewhat of a new process and had an experimental aspect to it.

There is no question in the Review Board's mind that there was a need for a public review. The process was somewhat rushed, particularly in the early stages, and did not provide sufficient time for all participants to review documents. The funding process was criticized by many participants, and yet the total amount provided of more than $300,000 appeared reasonable to the Board. A drawback respecting the funding was the lateness in the announcement of the availability of funds and in making the actual money available.

The Review Board believes its makeup was appropriate for the task. The varied backgrounds of individuals, each with a somewhat different perspective, assisted in the understanding of the many views which were placed before the Board.

The holding of hearings in 11 different communities provided the Review Board with a broad range of ideas regarding the proposal and allowed many members of the public to present their views. There were, however, some inefficiencies resulting from the extensive travel and the time constraints, and the many centres where information had to be made available. The Review Board was able to obtain the necessary administrative and expert assistance, but with some difficulty due to the time constraints.

The aspect of the review process which was most criticized by participants was the exclusion of the environmental impacts of the FMA from the terms of reference. The Review Board agrees that this was a serious short-coming, and combining the review of future mills with the FMA will make the overall review of the total project more effective and efficient.

(The responses to citizens' concerns and the effectiveness of the review process are discussed in Section 8.)

9.3 Matters Beyond the Terms of Reference of the Review Board

The Review Board is reporting to the Ministers on several concerns that were raised by a large number of participants although some are beyond its mandate. These include promoting the use of recycled paper and other products, possible effects of timber harvesting on global warming, timber harvesting practices in Wood Buffalo National Park and the need for ecological reserves in the FMA area.

9.4 Recommendations

On the basis of a review of the extensive information provided at the hearings or in written submissions, the Review Board has the following recommendations.

9.4.1 It is recommended that the proposed project not be approved until further river studies are conducted regarding chlorinated organic compounds. The work should include:

- surveys of fish, their habitats, and the food chains that support them;

- review of existing standards for water quality and human consumption; and
- determination of whether the Alberta-Pacific proposal can proceed without serious hazards to downstream users of the river system or aquatic life in it.

The studies should extend to the Northwest Territories and be conducted by the government having jurisdiction, depending on the part of the river system being dealt with. The studies should, however, be under the broad direction of an intergovernment committee and appropriate trans-boundary agreements or interim memorandums of understanding among governments should be developed.

9.4.2 It is recommended that the river studies recommended above include consideration of dissolved oxygen, downstream from the proposed and existing mills and to the Grand Rapids. The studies should include:

- fish surveys (as in 9.4.1);
- development and refinement of appropriate models;
- establishment of dissolved oxygen standards for various parts of the river; and
- determination of whether the Alberta-Pacific proposal can proceed and meet the governments' aquatic standards for the Athabasca River.

9.4.3 It is recommended that the river studies referred to above include a review of taste and odour problems in water, fish tainting, the nutrient content of the river system, and toxic trace metals.

9.4.4 It is recommended that the Indian Bands and Aboriginal People that would be affected by the FMA be involved in negotiation and discussion during the preparation of the FMA. Financial resources to enable effective participation should be made available to them and matters for their involvement should include:

- possible effects of the FMA on treaty rights or land claims;
- possible effects on the spiritual relationship between Aboriginal People and the forest;
- future needs of Reserve sawmill operations;
- appropriate buffers around Indian Reserve Lands;
- impacts on wildlife and wildlife habitat, and on trapping, hunting and fishing, including consideration of compensation for affected trappers;
- possible effects on wetlands, drainage patterns and plans for mitigation;
- plans to minimize impacts on Aboriginal People and their lands as a result of logging roads and improved access; and

- development of business and job opportunities and education and training programs.

9.4.5 It is recommended that a full public review of the FMA be conducted after the work referred to in 9.4.4, but prior to the approval of the Alberta-Pacific mill.

9.4.6 It is recommended that a further detailed review of the proposed site be conducted, with specific comparison to an alternative more remote site probably to the north of that now proposed. Local citizens who might be directly affected should be involved in the review.

9.4.7 If the mill proceeds, the following recommendations should be implemented to assist in minimizing environmental and social impacts:

- Alberta-Pacific should be required, to the extent possible, to hire local residents, including Aboriginal People, and generally maximize spending in the Athabasca-Lac La Biche region, in Alberta and in the remainder of Canada;

- training for local residents, including Aboriginal People, should be made available in a timely manner to increase their chances of participating positively in the project;

- strict rules should be developed and enforced at the construction camp;

- Alberta-Pacific should use fair and reasonable land acquisition practices;

- there should be co-ordination among local and other governments to ensure efficiency in making infrastructure available and sharing of government revenue, if necessary;

- plans for emissions to the atmosphere should be carefully reviewed by Alberta Environment, monitoring and inspections should be effective, and an odour complaint investigation plan should be developed;

- if the mill is to be located in a developed community, base-line soil monitoring should take place prior to the commencement of operations;

- if the mill proceeds in a developed agricultural community, a detailed complaints investigation process should be established;

- the spill and run-off containment system should be carefully designed and operated and effective emergency plans should be in place to deal with uncontrolled spills;

- surface water quality and quantity, including water wells, should be surveyed to provide base-line data prior to construction;

- if water supplies are affected, Alberta-Pacific should provide alternative sources, at no cost to landowners;

- solid waste disposal should be in accordance with all existing standards and should be closely monitored throughout construction and operations;

- Alberta Transportation and CN Railways should increase their involvement with the public and design roads and railways so as to minimize impacts on individuals and the environment;

- if the mill is built in a developed area, efforts should be made to reduce the unattractiveness as much as possible, and the mill should be designed so as to minimize noise;

- traffic patterns to and from the mill should be designed so as to minimize impacts on residents of the area;

- the water intake and effluent pipelines should be installed in a careful manner to ensure successful reclamation will be possible and to minimize impact on the Pine Sands Natural Area;

- efforts should be implemented to ensure that new people in the area understand the importance of the Pine Sands Natural Area and co-operate in protecting it;

- Alberta-Pacific should design its plant and related transportation systems so as to minimize the chances of accidental release of toxic materials;

- Alberta-Pacific should be required to develop an acceptable emergency response plan for every type of emergency that could occur; and

- Alberta Occupational Health and Safety should take the necessary steps to ensure that the highest safety standards are in place.

9.4.8 If the mill proceeds, a liaison committee should be established by the Alberta Minister of Environment. It should include representation by the mill operator, involved government departments and the affected public. Matters to be dealt with should include:

- plans to minimize social impacts due to the construction camp and other aspects of the mill's construction;

- monitoring plans with respect to emissions to the atmosphere;

- plans to dispose of solid waste and to protect local ground and surface water;

- detailed plans regarding roads and railways;

- details of plans to protect the Pine Sands Natural Area;

- development of plans to respond to emergencies;

- establishment of, and involvement in, a detailed complaints investigation process;
- surveys of water wells in the area; and
- soil surveys to provide base-line data.

9.4.9 It is recommended that the following changes be made to the EIA review process which might be used in future:

- any preliminary government approval should be limited to approval to proceed to regulatory review;
- all major proposals should be reviewed at public hearings;
- the public review should be by an independent review panel of an appropriate size and makeup;
- the review panel should look at all aspects of a proposal, including social and economic impacts and the technology, as well as impacts on the environment;
- the scope of an EIA should be determined at public meetings early in the process;
- those directly and substantially affected by the proposed project should be involved in the preparation of the EIA;
- adequate time should be provided throughout the process;
- projects should not be separated into different components for review purposes;
- an ecosystem approach should be used in dealing with environmental matters;
- if two or more jurisdictions are involved, serious efforts should be made to combine the public reviews;
- reasonable funding should be available early in the process;
- the number of hearing locations should not be too great; and
- plans should be made to provide administrative, technical and other assistance to future review panels.

Appendix A—Ministerial Orders and Terms of Reference

Province Of Alberta
Department Of The Environment
Ministerial Order No. 08/89
The Department Of The Environment Act

WHEREAS the Minister of Environment (the "Minister") may establish a board to act in an advisory capacity in connection with any of the policies, programs, services, or other matters under his administration.

AND WHEREAS the Minister has established a policy and program to identify and assess the environmental impacts of proposed developments in Alberta through the Environmental Impact Assessment Guidelines for the preparation of environmental impact assessment reports.

AND WHEREAS the Minister, pursuant to Section 8 of the Land Surface Conservation and Reclamation Act, has the authority to require the preparation of an environmental impact assessment report.

AND WHEREAS Alberta-Pacific Forest Industries Inc. (the "proponent") has proposed a bleached kraft pulp mill in the County of Athabasca (the "project") and the Minister has ordered pursuant to Section 8 of the Land Surface Conservation and Reclamation Act, the preparation and submission of an environmental impact assessment report for the project on December 22, 1988.

AND WHEREAS the proponent is required to undertake public consultation in the preparation of an environmental impact assessment so that the public and the proponent are able to identify potential environmental impact and concerns.

AND WHEREAS the proponent has prepared and submitted an environmental impact assessment report to the Minister entitled "Alberta-Pacific Forest Industries Inc. Environmental Impact Assessment, bleached kraft pulp mill" (the "EIA") dated May 8, 1989 together with associated supplemental information.

AND WHEREAS Alberta and Canada have each made provision for the environmental review of developments within their own spheres of jurisdiction and it is imperative that Alberta and Canada each make its decisions within the constraints of its own Constitutional jurisdiction;

AND WHEREAS in assessing the environmental impact of developments in Alberta with implications for both Alberta and Canada the potential exists for duplication and confusion in the application of the environmental assessment procedures of both jurisdictions;

AND WHEREAS Alberta and Canada deem it desirable to continue to strengthen coordination between the two Governments it is appropriate that they ensure that the environmental assessment procedures now required by each jurisdiction do not duplicate those of the other, and are respectful of jurisdiction;

AND WHEREAS Alberta and Canada agree to adhere to principles and procedures that ensure that the environmental assessment of developments in Alberta with implications for Alberta and Canada is carried out to the satisfaction of Alberta and Canada without creating confusion for the public or proponents and avoiding duplication, unnecessary delays and uncertainty.

AND WHEREAS Alberta and Canada have agreed that the undertaking of the project is primarily within the constitutional jurisdiction of Alberta.

AND WHEREAS Canada and Alberta have undertaken consultations pursuant to Section 32 of the FEARO Guidelines allowing variations to Sections 21 to 31 thereof.

AND WHEREAS it is necessary and desirable to conduct public hearings regarding the environmental impacts of the project.

THEREFORE I, RALPH P. KLEIN, Minister of Environment, pursuant to Section 6 of the Department of the Environment Act hereby establish a board to be known as "the Alberta-Pacific EIA Review Board" (the "Review Board") to advise and make recommendations upon the environmental impact of the project upon the following terms and conditions:

A. MEMBERSHIP

1. The Review Board shall consist of the members set out on the attached Schedule "A".
2. The Alberta members of the Review Board shall be paid remuneration and reasonable travelling and living expenses as specified in **Schedule 1, Part A of the Committee Remuneration Order being Order In Council 1175/80.**
3. The term of the Review Board shall be until a final report as described in section "D" is accepted by the Minister.

B. TERMS OF REFERENCE

The Terms of Reference of the Review Board shall be to hold public hearings:

1. To review the environmental impact of the project and the proposed mitigative measures, including an:
    a. examination of the expected cumulative impacts of effluent discharges on the Peace-Athabasca River system by taking into account existing and proposed discharges from other pulp and paper mills on the same river basin.
    b. examination of the potential environmental impacts that relates to areas of the Government of Canada's responsibilities specifically fisheries, navigable waters, potential impact on Wood Buffalo National Park, and potential water quality impacts in the Northwest Territories, and timber harvesting practices as they may affect Indian Reserve Lands.
2. To review the degree to which the local citizens' concerns have been addressed by the proponent.
3. To provide advice regarding the environmental acceptability of the project and terms and conditions as appropriate for inclusion in the necessary permits and licences.

C. PROCEDURES

1. Subject to the approval of the Minister and the procedures hereinafter described, the Board shall make rules of procedures governing the calling of meetings and hearings, the procedure to be used at and conduct of the meetings and hearings, reporting and any other matters as required.
2. The Review Board shall hold public hearings in the Town of Athabasca, Community of Prosperity, Town of Lac La Biche, City of Fort McMurray, Fort Smith (Northwest Territories) and such other locations in the project area as the Review Board deems necessary.
3. The Review Board will commence public hearings no later than four weeks from the date that Alberta Environment has distributed the deficiency review of the EIA to those who have indicated their desire to participate in the public hearings.
4. The Review Board will receive written and oral submissions from the public upon the EIA and any matter falling within the Terms of Reference of the Board.

D. REPORTING

1. The Review Board shall compiete its review on a timely basis consistent with the Terms of Reference.
2. The Review Board shall provide a report to the office of the Alberta Minister of Environment, who in turn will pass the report immediately upon receipt to the Federal Minister of Environment.
3. The Alberta Minister of Environment, in consultation with the Federal Minister of Environment, will make the report public in a timely fashion.

DATED at the City of Edmonton, in the Province of Alberta, this 11th day of July, 1989.

Ralph P. Klein
Minister of Enivornment

SCHEDULE "A"

ALBERTA-PACIFIC MEMBERSHIP OF THE EIA REVIEW BOARD *

NAME	
1. Mr. G. J. DeSorcy	Chairman
2. Mr. Ron Epp	County of Athabasca
3. Mr. Ted West	Town of Athabasca
4. Mr. Mike Franchuk	Improvement District #18S
5. Chief Jim Boucher	Fort McKay
6. Prof. William Ross	Canada
7. Dr. David Schindler	Canada

* The Northwest Territories will have an Ex-Officio observer.

Province Of Alberta
Department Of The Environment
Ministerial Order No. 14/89
The Department Of The Environment Act

I, Ralph P. Klein, MINISTER OF ENVIRONMENT, pursuant to Section 6 of the Department of the Environment Act hereby amend Ministerial Order 08/89 as follows:

1. Revise the list of Review Board members as per Schedule "A".
2. Add the following sentence to Section A, Membership, Subsection 2:

   "except where a Committee member suffers a loss of income as a result of time spent on Committee business in which case the Committee member could be reimbursed at the same rate of compensation paid by his employer".
3. Substitute Section A, Membership, Subsection 3 with: "The term of The Review Board shall be from July 11, 1989 until a final report as described in Section "D" is accepted by the Minister".

DATED at Edmonton, Alberta the 24th day of October, 1989.

Ralph P. Klein
Minister of Environment

SCHEDULE "A"
ALBERTA-PACIFIC MEMBERSHIP OF THE EIA REVIEW BOARD *

NAME	
1. Mr. G. J. DeSorcy	Chairman
2. Mr. Ron Epp	County of Athabasca
3. Mr. Ted West	Town of Athabasca
4. Mr. Mike Franchuk	Improvement District #18S
5. Chief Jim Boucher	Fort McKay
6. Prof. William Ross	Canada
7. Dr. David Schindler	Canada
* 8. Ms. Cindy Gilday	Northwest Territories
* 9. Mr. Bob Duncan	Alternate
*10. Mr. Ed Koehler	Alternate

* Denotes Additions

Terms of Reference
August, 1989

Purpose Of The Review Board

The EIA Review Board has now been formed and given its terms of reference by Ministerial Order 08/89 which was issued by the Alberta Minister of Environment in consultation with the Federal Minister of Environment.

The EIA Review Board considers that its purpose is to hold public hearings on the environmental impacts of the bleached kraft pulp mill proposed for the County of Athabasca by Alberta-Pacific Forest Industries Inc. (ALPAC). Based on those hearings, the Review Board will write a report providing advice and recommendations to the Alberta Minister of Environment, and through him, to the Federal Minister of Environment.

The Review Board will be examining all environmental impacts of the proposed pulp mill. These include:

a) biophysical impacts such as those which would relate to emissions to the air and discharges to the Athabasca River, and

b) socio-economic impacts such as those which would result from an increased work force in the region during construction and operation of the mill.

It will not be considering non-environmental aspects of the proposed mill, such as its financial feasibility, markets to be served, or the kraft mill technology used — other than to the extent that the technology impacts on the environment.

In considering the impact of the mill on the Athabasca River, the Review Board will be examining the cumulative effects on the Peace-Athabasca River system. In other words, the Review Board will be looking at the effects of existing discharges as well as those which would result from the ALPAC and other proposed mills on this river system.

The Review Board has been formed jointly by the Alberta and Federal governments. For this reason, it will be specifically looking at a number of impacts that relate to matters for which the Federal government is responsible. These will include potential impacts on water quality in the Northwest Territories, on fisheries, on navigable waters, and on Wood Buffalo National Park. The Review Board will also be examining and reporting on potential environmental impacts to Indian reserve lands as a result of the timber harvesting practices which will be used to provide raw materials to the proposed mill. However, the Review Board is not empowered to consider other environmental impacts related to the harvesting of timber for the mill. These impacts are dealt with through the Timber Management Planning Process of the Alberta Department of Forestry, Lands and Wildlife.

The Review Board will also report to the Minister on the way in which ALPAC has responded to the concerns of potentially affected persons and has recognized those concerns in its plans for the mill.

The Public Hearings

The EIA which was prepared by ALPAC and made public in May of this year, is currently being reviewed for completeness by the Alberta and Federal Departments of Environment. The Departments will be advising ALPAC of any additional information which is required to complete the EIA. Then ALPAC will respond. This part of the process is called the deficiency review. When this review is completed, Alberta Environment will make copies of it available to all interested parties and the Review Board will announce public hearings to begin about four weeks later.

The specific dates of the hearings will be discussed at public information meetings with interested citizens in the various locations where they will take place. There will be both day and evening sessions so that people can make presentations at a convenient time.

Public hearings will be held in Athabasca, Lac La Biche, Prosperity, Fort McMurray, and Fort Smith in the Northwest Territories. The Review Board hopes that all potentially affected and interested citizens will be able to attend one of the scheduled hearings. However, it is prepared to consider requests for hearings in other locations. Such requests should be sent to the Review Board as soon as possible and should include reasons why the additional hearing location is needed.

The Report

After the hearings are over, the Review Board will prepare a report containing advice about the environmental acceptability of the project and terms and conditions appropriate to include in the necessary permits and licences. That is, the Review Board will recommend:

1) whether the proposed mill could be constructed and operated in an environmentally satisfactory manner,

2) what measures are necessary to reduce or remove negative impacts or enhance positive ones, and

3) if the mill is to be approved, what conditions should be attached to that approval.

This report will be made public by the Alberta Minister of Environment, in consultation with the Federal Minister of Environment, in a timely fashion.

Appendix B—List of Presenters at the Hearings

Hearings of OCTOBER 30, 1989, at FORT McMURRAY

PRESENTATIONS BY:

MR. GERRY FENNER - ALBERTA-PACIFIC
MR. ROBERT STONE - ALBERTA ENVIRONMENT
MR. LEIGH NOTON - ALBERTA ENVIRONMENT
MR. ROBERT CREE - ATHABASCA TRIBAL CORPORATION
MR. EMIL GIRARD - ATHABASCA TRIBAL CORPORATION
DR. MICHAEL PERCY - ATHABASCA TRIBAL CORPORATION
MR. PHELPS - ALBERTA TRANSPORTATION
KAREN SCHMITKE
JOAN BROWN
KEVIN WILSON
RUTH KLEINBUB - FEDERATION OF ALBERTA NATURALISTS
KURT KLINGBEIL
MICHELLE PLANTE
GREG RICH
MR. GERRY FENNER - ALBERTA-PACIFIC
CHIEF WALTER JANVIER
MR. JEFF GREEN - JANVIER INDIAN BAND
MR. MARVIN MACDONALD - JANVIER INDIAN BAND
MR. JEROME SLAVIK - JANVIER TRIBAL ADMINISTRATION
CHIEF ROBERT CREE - ATHABASCA TRIBAL CORPORATION - JANVIER
ALVENA STRASBOURG - ALVENA STRASBOURG & ANDC - JANVIER
MR. ROBERT STONE - ALBERTA ENVIRONMENT - JANVIER

Hearings of OCTOBER 31, 1989, at FORT McMURRAY

PRESENTATIONS BY:

DR. LANE - DEPTS. OF ENVIRONMENT/FISHERIES & OCEANS
DR. ALLAN NICHOLSON - FORT. MCMURRAY & DISTRICT HEALTH UNIT
DR. BRUCE FLEMING - FORT MCMURRAY & DISTRICT HEALTH UNIT
ROSS DABRUSIN
MAYOR BETTY COLLICOTT - CITY OF FORT MCMURRAY
BOB WHETHAM - CITY OF FORT MCMURRAY
ROD MACLEAN
KRISTIN REED
PATRICIA GIROUX
PETER DOERING
MR. KEN HIGGINBOTHEM - ALBERTA FOREST SERVICE

Hearings of NOVEMBER 3, 1989, at LAC LA BICHE

PRESENTATIONS BY:

MR. GERRY FENNER - ALBERTA-PACIFIC - LAC LA BICHE
MR. ROBERT STONE - ALBERTA ENVIRONMENT - LAC LA BICHE
MR. JACK PHELPS - ALBERTA TRANSPORATION & UTILITIES - LAC LA BICHE
MR. CHARLES LENDZION - ALBERTA TRANSPORTION & UTILITIES - LAC LA BICHE
MR. JOHN MCINNES, M.L.A. - JASPER PLACE, EDMONTON
MR. TOM MACCAGNO

Hearings of NOVEMBER 4, 1989, at LAC LA BICHE

PRESENTATIONS BY:

MR. DERRICK PACHA - REGIONAL ECONOMIC DEVELOPMENT COUNCIL
BROWNIE SHYMONIAK
WAYNE WOOD - ALBERTA COMMERCIAL FISHERMEN'S ASSOCIATION
RON DESMIT - ALBERTA TRAPPER'S ASSOCIATION
TIM JUHLIN
JAMES HARCOURT
VICKI HARCOURT
MR. LETT - I.D. 18 SOUTH
BILL LEWISKI
DEBRA LOZINSKI
LUBA MALEC
MIKE MACCAGNO
MR. THOM - METIS ASSOCIATION OF ALBERTA
EMIEL ROBERTSON
LARRY AMIOT

Hearing of NOVEMBER 8, 1989, at BEAVER LAKE

PRESENTATIONS BY:

GERRY FENNER - ALBERTA-PACIFIC
CHIEF ALPHONSE LAMEMAN
HENRY GADWA (in CREE LANGUAGE)
MORRIS LEWIS (in CREE LANGUAGE)
VIC MACHATIS
MORRIS QUINN (in CREE LANGUAGE)
JIM JANVIER
JERAME WATCHMAKER (in CREE LANGUAGE)
EMILE QUINN
RALPH MAKOKIS (in CREE LANGUAGE)
CHIEF EUGENE PASCAL (via RALPH MAKOKIS)
CHIEF ERNEST HOULE - GOODFISH LAKE BANK
RON LAMEMAN

Hearings of NOVEMBER 9, 1989, at FORT CHIPEWYAN

PRESENTATIONS BY:

GERRY FENNER - ALBERTA PACIFIC
CHIEF MATTHEW LEPINE - CHIEF, FORT CHIPEWYAN CREE BAND
SAL MARTEN (IN CREE LANGUAGE)
JEFF GREEN
OLIVER GLANFIELD - PRESIDENT, FORT CHIPEWYAN TOURISM ACTION COMMITTEE
EMILE GIRARD
MR. CREURER - DELTA NATIVE FISHERMEN'S ASSOCIATION
ANDREA SIMPSON - ATHABASCA DELTA COMMUNITY SCHOOL
CHIEF JOHNSEN SEWEPAGAHAM - LITTLE RED RIVER TRIBE
JIM WEBB
FATHER CAMILLE PICHE
SONNY FLETT - FORT CHIPEWYAN METIS LOCAL
TERRY LUSTY
LEONARD FLETT
BAL ABBI
DR. PETER MCCART

Hearings of NOVEMBER 12, 1989, at FORT CHIPEWYAN

PRESENTATIONS BY:

MR. MCKAY - PEACE-ATHABASCA TRAPPER'S ASSOCIATION
KIM GUSEK
IRENE TUCCARO
DR. RON WALLACE
CHIEF PAT MARCEL - ATHABASCA CHIPEWYAN BAND
TONY PUNKO - EXECUTIVE DIRECTORY, ATHABASCA TRIBAL CORPORATION

Hearings of NOVEMBER 15, 1989, at FORT SMITH

PRESENTATIONS BY:

GERRY FENNER - ALBERTA-PACIFIC
ROBERT STONE - ALBERTA ENVIRONMENT
MAYOR D. BEVINGTON
DANIEL SONFRERE (in SLAVEY LANGUAGE)
JACQUES VAN PELT
ALEX HALL - NWT WILDLIFE FEDERATION
JACK VAN CAMP - NORTHWEST WILD ENVIRONMENT SERVICES
KENT HERBERT - NWT WILDLIFE FEDERATION
DR. STEPHEN - DIAND
MAYOR D. BEVINGTON - TOWN OF FORT SMITH
FRANCOIS PAULETTE
SHARONE MALDAVER
MAYOR KUDELIK - TOWN OF HAY RIVER
CHIEF ALEXIE - MACKENZIE DELTA TRIBAL COUNCIL
JACKIE EVANS
BILL ERASMUS - PRESIDENT DENE NATION
FRANK RIVERS - B.C. FISHERIES COMMISSION ENVIRONMENT COUNCIL
JEANNIE MARIE-JEWELL, M.L.A. - SLAVE RIVER

Hearings of NOVEMBER 16, 1989, at FORT SMITH

PRESENTATIONS BY:

TONY WHITFORD, M.L.A. - YELLOWKNIFE SOUTH
MR. HERON - METIS ASSOCIATION OF THE NWT
JUDY ROSCHLAUB - PEACE RIVER STOCKGROWER'S ASSOCIATION
ARNOLD LABRENTZ
DR. JACK BROMLEY - NWT MEDICAL ASSOCIATION
FRANK LAVIOLETTE
JONAS ANTOINE
JOHN DONIHEE - GOVERNMENT OF NWT
JIM BOURQUE - GOVERNMENT OF NWT
DR. DON GAMBLE
CHRIS O'BRIEN - ECOLOGY NORTH
WAYNE BRYANT - CITY OF YELLOWKNIFE
ETHEL BLONDIN
MICHAEL JONES
MARA CROZIER - PRESIDENT PWK HIGHSCHOOL STUDENTS' UNION
CARLA VAN PELT
KEN EAST - CANADIAN PARKS SERVICE
BILL HILL
VICTOR MARIE
CHIEF JERRY PAULETTE - FORT FITZGERALD DENE BAND
VINA BEAUGRAIN CHAMPAGNE
FREDA SCHUMANN
MARGARET KURSZEWSKI - SLAVE RIVER BASIN COALITION

Hearings of NOVEMBER 17, 1989, at ATHABASCA, ALBERTA

PRESENTATONS BY:

GERRY FENNER - ALBERTA-PACIFIC
MR. HOLLORAN - ALBERTA-PACIFIC
GORDON CRAIG - ALBERTA-PACIFIC
ROBERT STONE - ALBERTA ENVIRONMENT
CANADIAN NATIONAL RAILWAY (VIA BOB STONE)
DENNIS HART - ALBERTA ENERGY COMPANY
RICK HUFF - ALBERTA ENERGY COMPANY
JOHN ISBISTER - ALBERTA ENERGY COMPANY
DR. GARY VIGERS - ALBERTA ENERGY COMPANY
DR. LOUIS SCHMITTROTH - FRIENDS OF THE ATHABASCA ENVIRONMENTAL ASSOCIATION
ANNEMARIE SCHMITTROTH
FRANCES HANNA
ROMAN BIZON
JODY MCELLIGOTT
LORRAINE VETSCH
STUART REEDER - CANADIAN WILDLIFE FEDERATION
PETER SAGERT - FOREST PRODUCTS ASSOCIATION
ERNIE WALTER - TOWN OF ATHABASCA

Hearings at NOVEMBER 18, 1989, at ATHABASCA, ALBERTA

PRESENTATIONS BY:

BOB WILKINSON - COUNTY OF ATHABASCA
BILL KOSTIUW - COUNTY OF THORHILD
DR. ROBERT LANE - ENV. CANADA/FISHERIES & OCEANS
DR. LYLE LOCKHART - ENV. CANADA/FISHERIES AND OCEANS
TAMMY WARAWA
HARLAN LIGHT
KEVIN FLESHER
LYNDA HRUBIZNA
LINDA HRUBIZNA
GEORGINA LEWIS
CAROL HARTWIG - EAST KOOTENAY ENVIRONMENTAL SOCIETY
JOHN BERGEUSKE - RESIDENTS OF EAST KOOTENAY REGION
RALPH MAKOKIS - RESIDENTS OF EAST KOOTENAY REGION
JOHN BERGEUSKE - RESIDENTS OF EAST KOOTENAY REGION
DON CARTER - RESIDENTS OF EAST KOOTENAY REGION

HEARINGS ON NOVEMBER 20, 1989, AT ATHABASCA, ALBERTA

PRESENTATIONS BY:

DIANA SALOMAA - FRIENDS OF THE ATHABASCA
KATIE STEIN SATHER
PHIL ROWLANDS - CHAMBER OF COMMERCE
DR. WILLIAM A. FULLER MICHAEL GISMONDI
M.R. COUTNEY - ATHABASCA HEALTH UNIT
STAN WISKEL
KEN STASHKO
JANICE PITMAN
LYNDA HRUBIZNA
TAMMY WARAWA
JANICE PITMAN
ARNO BIRKIGT
JOAN SHERMAN
BILL CHRUSCH - FISH/GAME/TRAPPERS' ASSOCIATIONS
KEVIN RIZZOLI
GERALDINE MANOSSA
ERIC NEWBORN
JIM ROGERS

HEARINGS ON NOVEMBER 21, 1989, AT ATHABASCA, ALBERTA

PRESENTATIONS BY:

MS. HUTCHINSON - EDWIN PARR SCHOOL
GORDON LENNIE: (VIA DALE PLANTE)
DALE PLANTE/FRIENDS OF THE MILL
FLORENCE ELLIS
MR. JACK PHELPS - ALBERTA TRANSPORTATION/UTILITIES
DAVID COLES - CANADIAN PAPERWORKERS UNION
AGNES WURFEL
DAVID GREGORY
ANN STILES
NICK EVASIUK
NETTIE EVASIUK
MERILYN PERUNIAK
SHIRLEY STASHKO
ELLIE ROBSON/FRIENDS OF THE ATHABASCA
DR. BOB WILLES - ALBERTA-PACIFIC
PHIL BROWN
JORMA JYRKKANEN
MARY RICHARDSON
DR. H.A. SCOTT
DAN FARR
DR. ROBERT HOLMBERG

HEARINGS ON NOVEMBER 22, 1989, AT FORT RESOLUTION, NWT

PRESENTATIONS BY:

GERRY FENNER - ALBERTA-PACIFIC
BOB STONE - ALBERTA ENVIRONMENT:
DR. BOB LANE. - ENVIRONMENT CANADA
CHIEF BONNET ROUGE - FORT PROVIDENCE DENE BAND
JOSEPH FARCY (IN CREE LANGUAGE THROUGH INTERPRETER)
KAREN LAFFERTY - DENINOO COMMUNITY SCHOOL
JIM O'REILLY
DON MORIN:
DON BALSILLIE/ARTHUR BECK
DAVE BERGUNDER - FRESHWATER FISH MARKETING CORP.
DANNY BEAULIEU
DR. LANE - ENVIRONMENT CANADA
ERIC BRAATHEN - METIS ASSOCIATION LOCAL 51
JOHN DONIHEE - GOV'T OF NORTHWEST TERRITORIES
GERRY CHEEZIE - DENE NATION
LLOYD NORN
IRVIN NORN
GEORGE MARLOWE
ERIC BRAATHEN

HEARINGS ON NOVEMBER 23, 1989, AT PROSPERITY, ALBERTA

PRESENTATIONS BY:

GERRY FENNER - ALBERTA PACIFIC
JACK PHELPS - ALBERTA TRANSPORTATION AND UTILITIES
MOE MAHENDRAN - CANADIAN NATIONAL RAILWAY
RUDY WILLHAUK, - ALTA. PUBLIC SAFETY SERVICES
BARRY JOHNSTONE
DR. JOHN ASHWORTH

HEARINGS ON NOVEMBER 24, 1989, AT PROSPERITY, ALBERTA

PRESENTATIONS BY:

N.W.T. CANOEING ASSOCIATION
EMIL ZACHKEWICH
ALBERT STEWART
BROWNIE SHYMONIAK
JIM STEVENS - ALBERTA-PACIFIC
PETER OPRYSHKO
JIM AND LORI ZACHKEWICH

HEARING OF NOVEMBER 25, 1989, AT FORT MCMURRAY, ALBERTA

PRESENTATIONS BY:

YVONNE LAVIGNE
JOHN HOPKIN
TAMI WEBER
SONJA HOPKI
VERNE DUGAS
MR. ROGERS - FORT MCMURRAY TRAPPERS ASSOCIATION
KATHY RAINES/BRUCE STRAND:
RUTH HAMLYN
CHRIS MACLEAN

HEARING OF NOVEMBER 30, 1989 AT EDMONTON, ALBERTA

PRESENATIONS BY:

GERRY FENNER - ALBERTA-PACIFIC
MR. DEKKER - CANADIAN WOLF DEFENDERS
KATHERINE WYATT
NANETTE HAMILTON WANYANDIE
MR. JONES -
LARRY DESMEULES - METIS/INDIAN ASSOCIATIONS OF ALBERTA
MR. FREELAND - TRAVEL INDUSTRY ASSOCIATION OF NWT
JOHN DAY - EDM. ECONOMIC DEVELOPMENT AUTHORITY
BILL ALLCOCK - EDM. ECONOMIC DEV. AUTHORITY
GRANT MITCHELL - M.L.A. EDMONTON MEADOWLARK
WILLIAM STOLLERY - PRO-CANADA NETWORK, ALBERTA
ANDY BOYD - SHERWOOD PARK FISH & GAME ASSOC.
DR. LOCHAN BAKSHI - ENVIRONMENT COUNCIL OF ALBERTA
DR. PETER MURPHY - ALBERTA FORESTERS ASSOCIATION
VIVIAN PHARIS - ALBERTA WILDERNESS ASSOCIATION
GRAHAM DOBSON - MECHANICAL CONTRACTORS ASSOCIATION
JERRY PASCHEN
ELIZABETH PASCHEN
MAVIS AVERILL/LINDA ROWAN
DR. PATRICK HESSEL
JACQUES JOHNSON - R.C. MISS. OBLATES/SOCIAL JUSTICE COMM.
DAVID J. PARKER
KEVIN FLESCHER
RANDY LAWRENCE
ROSS CAMPBELL
LYNDA HRUBIZNA
BILL PHIPPS - INTER-CHURCH COMMITTEE ON THE NORTH
LINACRE GRIFFITHS
ED HANSON
NORMAN ENG
JIRI SELNER
LESLEY BROWN
WALTER PULLISHY
JOHN MCDOUGALL - EDMONTON CHAMBER OF COMMERCE

HEARING ON DECEMBER 1, 1989, AT EDMONTON, ALBERTA

PRESENTATIONS BY:

MAYOR PAT MCMAHON - CITY OF YELLOWKNIFE
DON CURRIE - ALBERTA CHAMBER OF RESOURCES
BRIAN TOOLE
GEORGE MORRISON
CHIEF BERNIE MENEEN - ABORIGINAL RESOURCE DEVELOPMENT GROUP
ELISABETH BEAUBIEN - ALBERTA NATIVE PLANT COUNCIL
DR. KOSTUCH - ALTA. FISH & GAME ASSOCIATION
CLEVE WERSCHLER
MIKE QUINN - WORLD WILDLIFE FUND CANADA
ALBERTA NATIVE PLANT COUNCIL
BOB HENDERSON
DOROTHY MACDONALD:
DR. JACK VALLENTYNE - ATHABASCA TRIBAL COUNCIL
ROD OLSTAD
ANDREW BACHELDER - PEMBINA INSTITUTE FOR APPROPRIATE DEVELOPMENT.
MR. GARDNER - FEDERATION OF ALBERTA NATURALISTS
JAMES DARWISH
MIKE MEAGHER - ALBERTA LOGGING ASSOCIATION
HARRY GARFINKLE - GREEN PARTY
RITA EGAN
MICHAEL M'GONIGLE - GREENPEACE CANADA
DR. DANIEL LEVINSON
GENE FRIZZELL
JOAN MARGEL
DIANE KOYICH
NATASHA BAERT
GERRARD MACKINNON - ACADEMICS CONCERNED ABOUT SUSTAINABLE DEVELOPMENT
JOHN DONIHEE - DEPT. OF RENEWABLE RESOURCES, NWT
BILL CHRAPKO - ALBERTA PUBLIC HEALTH ASSOCIATION
DR. SCOTT - FRIENDS OF THE NORTH
DR. JIM BUTLER - FRIENDS OF THE NORTH
BILL ABERCROMBIE - ALBERTA FUR COUNCIL
LAURA STEVENS - ALBERTA FUR COUNCIL

HEARINGS OF DECEMBER 2, 1989, AT EDMONTON, ALBERTA

PRESENTATIONS BY:

JOHN SHEEHAN - FRIENDS OF THE PEACE
JANET KARASEK - FRIENDS OF THE PEACE
WENDELL KONING - FRIENDS OF THE PEACE
DR. SANDY MURRAY - ALBERTA MEDICAL ASSOCIATION
ROLF NIELSON - ALBERTA FEDERATION OF LABOUR
WINSTON GERELUK - ALBERTA FEDERATION OF LABOUR
CLAIRE DANSEREAU - INTERNATIONAL WOODWORKERS OF AMERICA
TOM OLENUK - EDMONTON & DISTRICT LABOUR COUNCIL
GEORGE ROZON - CANADIAN PAPERWORKERS UNION
DR. RAY RASMUSSEN - CANADIAN PAPERWORKERS UNION
DR. LOUIS SCHMITTROTH - FRIENDS OF ATHABASCA ENV. ASSOC.
DR. EDWARD MCBEAN, - FRIENDS OF ATHABASCA ENV. ASSOC.
FRANK POPE - SHIHTA REGIONAL COUNCIL:
MITCH BRONAUGH
GARY BOHNET - DENE/METIS NEGOTIATIONS SECRETARIAT
DR. GEORGE DIXON - DENE/METIS NEGOTIATIONS SECRETARIAT
MS. TURBAYNE - DIAND
KEVIN SISK - CHURCH OF REFORMED DRUIDS
BARBARA COLLIER
RICK PYSYK
DR. NIELS DAMGAARD
KARL ZAJES - WARBURG/PEMBINA SURFACE RIGHTS GROUP
CHRISTIAN BUCK - SIERRA CLUB
PATRICK CALLAGHAN - ENVIRONMENTAL CAMPUS ORGANIZATION
GODO STOYKE
ANDREW SPENCER
VALERIE KENNEDY
NOEL DOWNHAM
RICHARD THOMAS
ROBIN ROBINSON - UNIVERSITY WOMEN'S CLUB
PAMELA MCCLUSKY - ASSOC./ENVIRONMENTAL CONCERNS TODAY
JUDY EVASKI-MCLEAN - RIVERDALE HOUSING CO-OP
ELIZABETH SHELDON
DAVID ROLES
GLEN MCLEAN
FRANK SLOAN

HEARINGS OF DECEMBER 4, 1989, AT EDMONTON, ALBERTA

PRESENTATIONS BY:

MR. HOLLORAN - ALPAC PRESENTATION: DISSOLVED OXYGEN
DR. IAN BIRTWELL - ENVIRONMENT CANADA PRESENTATION: DISSOLVED OXYGEN
MR. DONIHEE - GOV'T OF NORTHWEST TERRITORIES
DR. BRUCE FLEMING - ALPAC PRESENTATION: DIOXINS/ORGANOCHLORINE COMPOUNDS
DR. BOB WILLES - ALPAC PRESENTATION: TOXICOLOGY OF DIOXINS

HEARINGS OF DECEMBER 5, 1989, AT WABASCA, ALBERTA

PRESENTATIONS BY:

CHIEF BEAVER - BIGSTONE CREE BAND
CHIEF LUCAS - BIGSTONE CREE BAND
DR. DAVID SUZUKI - BIGSTONE CREE BAND
JEANNE CARDINAL - BIGSTONE CREE BAND
TARA CULLIS-SUZUKI - BIGSTONE CREE BAND
ANTHONY PEARSE - BIGSTONE CREE BAND
LAURA KEETH - MOTHER EARTH HEALING SOCIETY
DR. COLIN CRAMPTON - BIGSTONE CREE BAND
DARRELL ROWLEDGE - BIGSTONE CREE BAND:
REVEREND PETER HAMEL - BIGSTONE CREE BAND
MIKE BEAVER - BIGSTONE CREE BAND
IRVIN BEAVER - AVC/CVC STUDENTS
MR. HAROLD CARDINAL
GWEN UHLICK-SCHMIDT
DAVID MCCONNELL - FRIENDS OF THE SLAVE
BERNIE CARLSON
BONNIE MCCLUSKEY
PAULA HEIJNEMANS - NORTH COUNTRY COMMUNITY ASSOCIATION
PAULA HEIJNEMANS - PERSONAL NOTE

HEARINGS OF DECEMBER 7, 1989, AT GRASSLAND, ALBERTA

PRESENTATIONS BY:

DR. WILLES - ALPAC PRESENTATION: DIOXINS AND FURANS
MR. CRAIG - ALPAC PRESENTATION: DIOXINS AND FURANS
MR. CRAIG - ALPAC PRESENTATION: ORGANOCHLORIDES
MR. HOLLORAN - ALPAC PRESENTATION: DIOXIN LOADINGS
MR. MCGEACHIE - ALPAC PRESENTATION: ACTIVATED SLUDGE TREATMENT
MR. NOTON - ALTA. ENVIRONMENT PRESENTATION: NUTRIENTS
MR. HAMILTON - ALBERTA ENVIRONMENT PRESENTATION: DOSTOC MODEL
DR. RAMAMOORTHY - ALBERTA ENVIRONMENT PRESENTATION: ORGANOCHLORIDES
DR. BOB LANE - ENVIRONMENT CANADA/FISHERIES AND OCEANS
ROSA AND WILLIAM EBERHARDT
DR. LAMB - ALPAC PRESENTATION: AIR EMISSIONS
MR. LORE - ALPAC PRESENTATION: ANIMAL HEALTH EFFECTS
DR. ENARSON - ALPAC PRESENTATION: HUMAN HEALTH
DR. JEFFRIES - ALPAC PRESENTATION: HUMAN HEALTH
MR. KOCIUBA - ATMOSPHERIC ENVIRONMENT SERVICE

HEARINGS OF DECEMBER 8, 1989, AT GRASSLAND, ALBERTA

PRESENTATIONS BY:

EILEEN CHRISTENSEN
ARNO BIRKIGT
DR. EVERETT PETERSON
BRENT APPLEGATE - WANDERING RIVER & DISTRICT LOCAL DEV. SOC.
HENRY PIRKER
OVILA ST. JEAN
EDWINA BOBOCEL - ATHABASCA REGIONAL ECONOMIC DEV. ASSOC.
FRANK CRAWFORD
DENNIS RYBICKI
MARY RYBICKI
MR. ALEXANDER - FRESHWATER FISH MARKETING CORPORATION

HEARINGS OF DECEMBER 14, 1989, AT PROSPERITY, ALBERTA

PRESENTATIONS BY:

MR. MELNYCHUK - ALBERTA ENVIRONMENT: WATER MANAGEMENT
DR. MACLOCK - ALBERTA ENVIRONMENT: PUBLIC INVOLVEMENT
MR. MCCLURE - ALBERTA ENVIRONMENT: DISSOLVED OXYGEN
MR. BEATY - ALBERTA ENVIRONMENT: AIR QUALITY
MR. SMITH - ALBERTA ENVIRONMENT: SUSTAINABLE DEVELOPMENT
MR. MACNICHOL - ALBERTA ENVIRONMENT: ENVIRONMENTAL PROTECTION
GEORGE FLEMING - PROSPERITY ENVIRIONMENTAL ASSOCIATION
DR. WALLACE - PROSPERITY ENVIRIONMENTAL ASSOCIATION
DR. CATON - PROSPERITY ENVIRIONMENTAL ASSOCIATION
JUDY BENNETT - PROSP. ENV. ASSOC.: SITE SELECTION REVIEW
TED PITMAN
CHRIS PITMAN
AMY MAKAR/CRAIG HEATH
DR. PETER HOLT - FRIENDS OF THE ATHABASCA
IRVIN NORN - ATHABASCA TRIBAL CORPORATION
DORIS STEWART
DR. ALLEN MAHEDEN
ROBERT KWONG - BOYLE AND DISTRICT CHAMBER OF COMMERCE
CLAUDETTE SHERMATA
DR. MICHAEL SMITH
JACK MCKOEN

HEARINGS OF DECEMBER 15, 1989, AT PROSPERITY, ALBERTA

PRESENTATIONS BY:

MARIE LENNIE
ELI AND NELLIE CHOLACH
TONY ZACHKEWICH
LEN SNOW - PULP, PAPER & WOODWORKERS OF CANADA
HARLAN LIGHT
ROBERT CAMERON - SOUTH PEACE ENVIRONMENTAL ASSOCIATION
DAVE RIDGEWAY - SOUTH PEACE ENVIRONMENTAL ASSOCIATION
KIMBERLY GUSEK - STUDENTS OF FORT CHIPEWYAN DELTA KIDS
CORDILLA CARDINAL - STUDENTS OF FORT CHIPEWYAN DELTA KIDS
DAWN LAWSON
JOAN SHERMAN
JOHN MCINNIS
PETER OPRYSHKO
WALTER HARRYNUCK - VILLAGE OF BOYLE
WALTER ALEKSIUK
DALE PLANTE - FRIENDS OF THE MILL
NICK AND MARY ZILINSKI
MR. FLEMING - PROSPERITY ENVIRONMENTAL ASSOCIATION
DR. R. NEIL BROWN
NORMAN CONRAD
GOVERNMENT OF THE NORTHWEST TERRITORIES
DR. W.C. HULBERT
KAREN GAINER - HEALTH UNIT ASSOCIATION OF ALBERTA

Appendix C—Review Board Members' Biographies

Members Of The Alberta-Pacific Environment Impact Assessment Review Board

Gerry DeSorcy, chairman. Born and raised in Alberta, DeSorcy is also Chairman of the Energy Resources Conservation Board. He lives in Calgary.

Jim Boucher is Chief of the Fort McKay Indian Band. Born and raised in Alberta, he has been a member of a number of task forces and environmental review teams related to northern energy developments. He is also a member of the Board of Governors of Keyano College.

Ron Epp is a pilot who has lived in the County of Athabasca for five years and prior to that for nine years in Lac La Biche. He was born and raised in Alberta, and is actively involved in the community.

Mike Franchuk lives in Wandering River, where he has farmed for 25 years. Born and raised in Alberta, Franchuk has been a director of the local Agricultural Society and is on the Board of a local hospital.

Cindy Gilday lives in Yellowknife, but is originally from Fort Franklin. She is a graduate of the University of Alberta, and her background includes nine years of teaching in the Northwest Territories. She was the co-ordinator for the Dene Nation Communications, and during the past five years her work has focused in the area of environmental issues through Indigenous Survival International, and in the area of fur issues where she has worked internationally.

Bill Ross is a Professor of Environmental Science at the Faculty of Environmental Design,The University of Calgary. He has been a member of the Banff Highway Twinning and CP Rail Rogers Pass Federal Review Panels, 1979 to 1983. One of his major areas of research interest is in the public hearing process and Environmental Impact Assessment procedures.

David Schindler is an environmental scientist and Killam Professor at the Department of Zoology, Faculty of Science, University of Alberta. Prior to this he was with the Freshwater Institute, Canadian Department of Fisheries and Oceans in Winnipeg. He served as head of the Experimental Lakes Project from 1968 to 1986. Dr. Schindler received his doctorate from Oxford University, England, where he studied as a Rhodes Scholar. He has headed the International Joint Commission's Expert Committee on Ecology and Geochemistry and the U.S. National Academy of Sciences' Committee on the Atmosphere and the Biosphere.

Ted West is the Superintendent of Schools for the County of Athabasca, and has been an educator in Alberta for more than 32 years. Born in Saskatchewan, he grew up in the Vulcan area, and works with a number of community organizations.

Alternate Members:

Bob Duncan has lived in Fort McMurray for 32 years. Now retired, he was a District Manager for Alberta Power for 38 years. Born in Stony Plain and raised in the Grande Prairie and Peace River areas, Duncan was Deputy Chairman of the Northeast Commission and the Northern Development Council.

Ed Koehler lives in West Athabasca, where he was born and raised. He operates a mixed farming operation, and is involved in various community groups and boards.